Bering Sea Ecoregion
Strategic Action Plan

Part I

First Iteration
December 2004

WWF

The Nature Conservancy
SAVING THE LAST GREAT PLACES ON EARTH

Part 1. Bering Sea Ecoregion: Strategic Action Plan - First Iteration

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Introduction to the Plan

The following Strategic Action Plan ("Plan") for the Bering Sea was prepared by the World Wildlife Fund (WWF) and The Nature Conservancy (TNC) and is intended, in this first iteration, primarily for use as an internal WWF and TNC document. In addition, if portrayed as a 'draft' plan, it will be a valuable tool to engage with other organizations involved in Bering Sea conservation and resource management (see Part II, Section 2 for a list of these organizations).

It is assumed that those reading this document have a working knowledge of the ecoregion's resources and the factors that affect them. Because TNC and WWF are actively engaged in projects to conserve seabird and pinniped populations, we have included more detail on these biological features. Other features contain less detail because they 1) are not species we are currently focused on, or 2) the relevant data are not compiled in a readily accessible format.

We had three objectives in developing this Plan:

1. To develop a decision support tool for WWF's and TNC's work in the Bering Sea for the next 10 years that will;
    a) Clarify and guide actions and investments;
    b) Define explicit biological and threat abatement goals and benchmarks; and
    c) Identify monitoring needs
2. To test the TNC "enhanced 5-S planning framework" (outlined in Section 2.3); and
3. To build the foundation for a broader, longer term Bering Sea conservation planning process that we hope will include multiple NGO and government partners.

WWF and TNC will use this first iteration plan to guide our conservation efforts during the next 2 years. We will also use the plan to initiate discussions with additional NGOs and stakeholders about contributing to the on-going planning and implementation process with the goal of having multiple partners engaged in coordinated conservation efforts in the Bering Sea. We further hope that many of these partners will formally sign on to this plan or future iterations. Our next step is to integrate a peer review of this document by our Russian colleagues and additional science experts. By 2007 we, with the help of additional partners, will produce the next iteration of this plan.

The Plan is composed of two parts: Part I is the Strategic Action Plan, per se, and includes information about the planning method; threats to select conservation targets; goals, objectives, and strategies; an implementation and monitoring plan; and next steps. Part I also includes the tabular outputs from the E5S Planning Tool. Part II of this document contains a compendium of "other resources" related to the Plan, including: summaries of previous Bering Sea conservation plans; contact information and activities of other Alaskan and Russian conservation partners; and detailed biological information about the selected conservation targets (biological features).

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Part I: Bering Sea Ecoregion Strategic Action Plan - First Iteration

1. INTRODUCTION

1.1 Description of the Bering Sea Ecoregion

The Bering Sea, a large, semi-enclosed sub-polar marine ecosystem, is among the most productive marine ecosystems on earth. Shared by the former Soviet Union and the U.S., the 23,000,000 hectare Bering Sea is bounded on the south by the Aleutian Islands, to the east by mainland Alaska, to the west by Kamchatka and the Chukotka Peninsula, and to the north by the Bering Straits and Chukchi Sea (Figure 1). The surface of the Bering is seasonally covered with pack ice as far south as the Pribilof Islands; in the summer, the ice front retreats to the Chukchi Sea.

The Bering Sea ecosystem includes both Russian and U.S. waters as well as international waters. The Bering Sea is influenced by the neighboring waters of the North Pacific Ocean, in particular the Gulf of Alaska. Additionally, the physical processes occurring in the Chukchi Sea make this water body a critical component of the Bering Sea ecoregion. The region sustains over 100,000 people, including the Aleut, Yup'ik, Cup'ik and Inupiat people who live along the Alaska coast, as well as Koryak, Yup'ik, and Chukchi peoples along the Russian coast and Aleut people on the Commander Islands. U.S. commercial fisheries in the Bering Sea approach $1 billion per year and account for more than half of all annual domestic fish landings. In the 1990s, Russian catches of fish and invertebrate in the Bering Sea comprised a third of the country's commercial harvest. These fisheries generated approximately $600 million per year. Bristol Bay has the world's largest red salmon fisheries.

1.2 Biological Significance

The Bering Sea is biologically diverse, with 450 species of fish and shellfish, 50 species of seabirds, and 26 species of marine mammals. The coastal fringe, including eelgrass beds, extensive coastal lagoons, deltas, wetlands, and estuaries, supports a similar abundance and diversity of waterfowl. Alaska's Yukon-Kuskokwim Delta, one of the world's largest wetland complexes, serves as breeding and feeding ground for 750,000 swans and geese, two million ducks, and 100 million shorebirds and seabirds. The Y-K Delta is North America's most important waterfowl nesting area. The islands that punctuate the Bering Sea, such as the Pribilof Islands, St. Lawrence and St. Matthew, the

Aleutians, and the Commander Islands provide critical breeding ground for millions of seabirds, Steller sea lions, and northern fur seals.

At Sea, much of the biological activity is concentrated in areas of nutrient upwelling along the Aleutian Arc, the edge of the continental shelf, across the northern shelf and along the Russian coast from the Kamchatka Peninsula to Cape Navarin.

Additionally, open waters associated with ice-covered seas (called polynyas) are highly productive areas critical to the region's biota. Passes in the Aleutian Islands (such as Unimak Pass) and the Bering Strait further focus migrating species in key, sensitive areas.

In 1996 World Wildlife Fund (WWF) and an international group of conservation scientists identified the Bering Sea Ecoregion as one of the most globally significant ecoregions on earth based on species richness, endemism, unique higher taxa, unusual ecological or evolutionary phenomena, and global rarity of habitat types.

1.3 Changes in the Bering Sea

Throughout the last century, commercial whaling and fishing, introduced species, and possibly pollution have contributed to dramatic ecological changes throughout the Bering Sea. Over the last few decades, these human-caused stresses have exacerbated the natural fluctuation caused by climate change.

Signs of stress are present throughout the trophic food web. For example, the once lucrative king crab fishery is virtually gone. Herring, a previously dominant fish, has declined in the eastern Bering Sea, creating a shortage of preferred food for top predators and seabirds. Fishermen report traveling further and further as local stocks are depleted. The apparent collapse of the snow crab population (once ranked as the third most valuable fishery in the region) in 1999 is another sign of significant change in the sea.

There are other signs of significant change in the ecoregion, such as declines of a number of wildlife species. For example, of the 26 species of marine mammals inhabiting the Bering Sea:

- Seven great whales are listed as endangered under the Endangered Species Act (ESA);
- The endangered Steller's sea lion has declined by 80 percent in the past twenty five years;
- The northern fur seal is listed as "depleted" under the Marine Mammal Protection Act; and
- Sea otters have declined dramatically in the western Aleutian Islands and have recently been petitioned for listing under the ESA.

Of bird species:

- The short-tailed albatross is endangered; the spectacled and Steller's eiders are threatened under the ESA, and king eiders are proposed as "threatened" species under the ESA;
- Red-faced cormorants have declined on St. Paul Island by 70 percent since the mid 1970s; and

- Red-legged kittiwakes, an endemic species, have declined by 40 to 60 percent throughout the Pribilof Islands during the same period.

The complexity of addressing such issues in a marine ecosystem is especially challenging because of the international nature of the Bering Sea. Added to this complexity are the problems of a boundary dispute between Russia and the United States, and less than ideal collaboration across shared borders, both of which create difficulties for joint management efforts.

1.4 The Playing Field

Below is a description of the major players in Bering Sea Conservation. For a listing of other Alaskan and Russian Bering sea Stakeholders, please see Part II, Section 2 of this document.

In Alaska

Marine fisheries management and marine habitat protection authority rests largely with National Marine Fisheries Service (NMFS/ NOAA Fisheries), with the North Pacific Fishery Management Council (NPFMC) playing a strong advisory role. Various segments of the commercial fishing industry have organized in fishing associations (e.g., At-Sea Processors Association, United Catcher Boats) to advocate for management actions that typically benefit their members.

Other marine biodiversity is managed by federal agencies including NOAA (whales, Steller sea lions, northern fur seals), U.S. Fish & Wildlife Service (USFWS; walrus, seals, sea otters, polar bears, and migratory birds). There are also Alaska-based organizations that work with the federal agencies in a co-management role (e.g., Alaska Eskimo Walrus Commission).

The Nature Conservancy in Alaska (TNC) and World Wildlife Fund's (WWF) Bering Sea Ecoregion Program have partnered in various conservation efforts in the Bering Sea, including the Bering Sea ecoregional assessment, Pribilof Islands conservation plan, and planning and implementation of the Pribilof Islands Collaborative. WWF has also partnered in conservation efforts in the Bering Sea with the Wild Salmon Center and Pacific Environment.

Pacific Environment and WWF both have activities that cross over to the Russian side of the Bering Sea. Pacific Environment also help found and currently supports the Bering Sea Forum – a body to bring a voice to conservation and community interests on both sides of the Bering.

Other conservation organizations active in marine conservation in Alaska include: the Alaska Marine Conservation Council (AMCC – a conservation voice for fishing-dependent communities and smaller-scale fisheries), The Ocean Conservancy (formerly Center for Marine Conservation), and Oceana. Both The Ocean Conservancy and Oceana have focused on litigation and advocacy in front of the NPFMC. Trustees for

Alaska and Earthjustice have advanced litigation against NMFS to change fishing regulations to protect Steller's sea lions. The Alaska Conservation Foundation has pulled most of these groups together in a network of marine conservation interests called the Alaska Ocean Network. One additional group worth mentioning is the Marine Conservation Alliance, a group funded by the fishing industry to advance conservation actions, such as debris removal from Pribilof Island beaches.

In Russia

The Agency for Fishery of the Ministry for Agriculture and Dept. for Fishery Policy of the Ministry of Natural Recourses are involved in fisheries management and marine habitat protection. The Federal Border Service plays a key role in enforcement of the 200 miles EEZ. The regional Administrations' Scientific and Fishery Management Councils play an advisory role. Regional commercial fishing associations advocate for management actions that typically benefit their members (See K. Zgurovsky paper in Part II, Section 4.3).

Indigenous people's associations and NGOs in Kamchatka and Chukotka are deeply involved in protection of indigenous people right protection and traditional fisheries and hunting support. They are also partners in conservation activities. Other conservation organizations active in marine conservation in Kamchatka and Chukotka include the Kaira Club in Chukotka and the League of Independent Experts in Kamchatka.

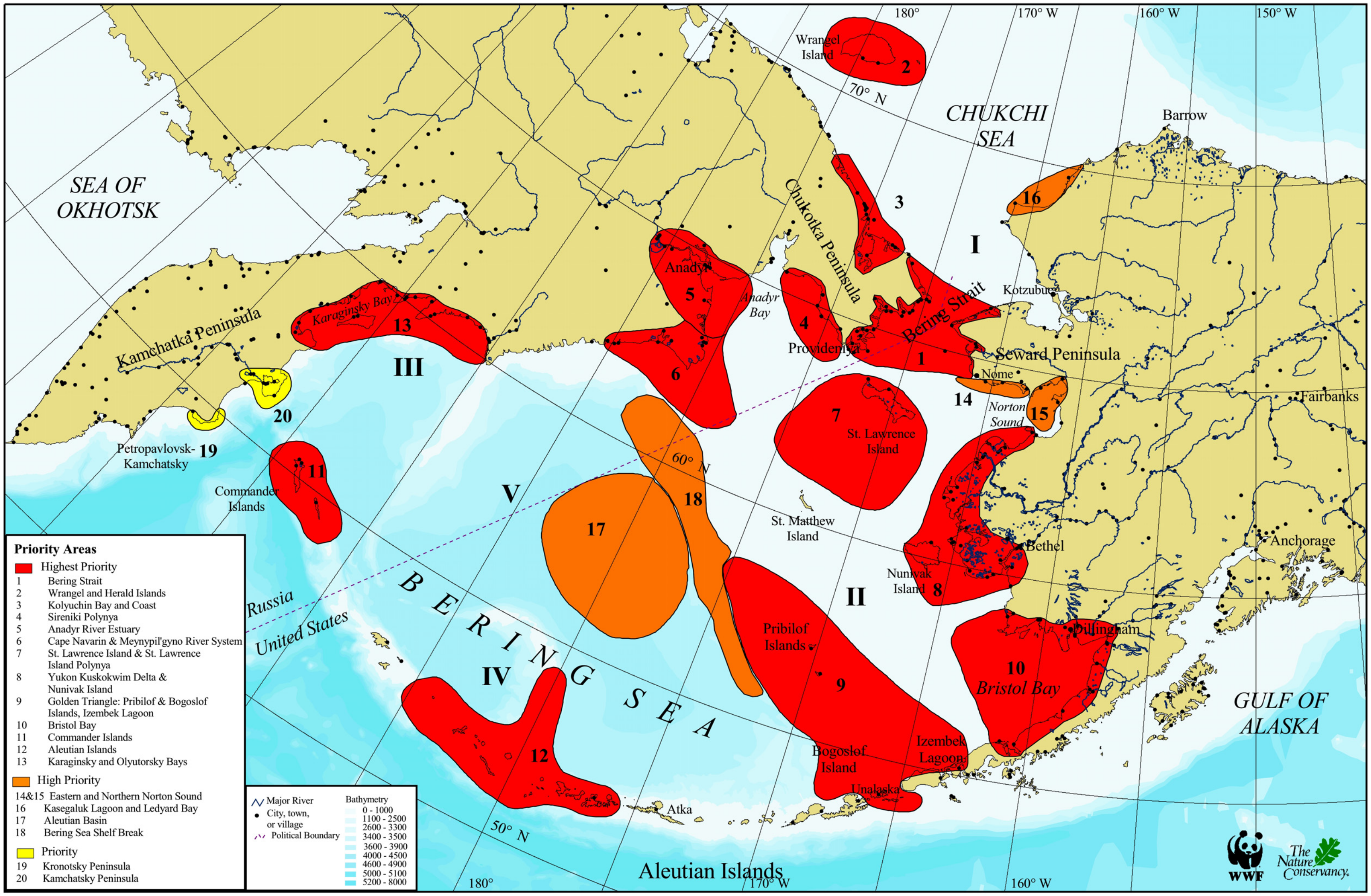
1.5 Ecoregion-Based Conservation in the Bering Sea (1999)

In 1999, WWF and The Nature Conservancy collaborated on development of a Bering Sea biodiversity assessment called *Ecoregion-Based Conservation in the Bering Sea* (1999). Experts in oceanography, marine mammals, seabirds and other disciplines from Alaska and Russia convened for a four day workshop and drafted a portfolio of 20 priority marine and coastal sites and a prioritized list of threats to the ecoregion's biodiversity. This Plan is intended to pick up where *Ecoregion-Based Conservation in the Bering Sea* left off.

During the workshop, experts identified the top-ranked threats as: fisheries mismanagement, invasive species, pollution, marine debris, and global climate change. Workshop participants also identified information gaps that represent opportunities for WWF and TNC to work with communities, user groups (e.g., commercial fishing interests), and management agencies to expand research, bring best available planning tools for biodiversity conservation to the table and work with affected communities and user groups to address conservation needs.

One of the most significant outcomes of the 1999 workshop was a map of Priority Areas for conservation in the Bering Sea Ecoregion (Figure 1). Tables listing biological features of and threats to these Priority areas are in Sections 4 and 7 of this document, respectively.

Figure 1: Bering Sea Ecoregion Priority Conservation Areas



Map prepared by Emma Underwood and Jennifer D'Amico
Conservation Science Program, WWF, May 1999

1.6 Current Staffing, Resources, and Programs

Staffing

At WWF, there are currently 7.75 FTE's dedicated to programs in the Bering Sea Ecoregion in the US and Russia (3.75 in the U.S., 3 in Russia, and 1 working in both US and Russia). For 2004, of these 7.25 FTE's, 1.75 were fully directed at the Coastal Communities for Science Program and approximately 1.5 FTE's were fully directed at the Pribilof Islands Collaborative. At TNC, there are 0.75 FTE's focused primarily on Bering Sea Ecoregion activities. For 2004, the 0.75 FTE was directed primarily at the Pribilof Islands Collaborative, with some directed toward invasive predator eradication work.

Resources

The FY 2005 Budget for TNC Bering Sea Ecoregion activities is approximately $100,000. The FY 2005 Budget for WWF Bering Sea Ecoregion activities is approximately $953,000.

Programs

WWF, TNC (with other conservation organizations interested in working in the Bering Sea Ecoregion) have recently engaged in or are currently engaged in a number of projects throughout the region; Table 1 presents a summary of these projects.

Table 1. Current Bering Sea Conservation Actions

Project/Action	Implementing Party(ies)	Timeframe
Pribilof Islands		
Pribilof Islands Collaborative	WWF, TNC, other stakeholders	Through 2006
Pribilof Islands data analysis (Habitat Conservation Area, mapping habitats, ect.)	WWF, TNC	On-going
Pribilof Islands brochures and signs	WWF, USFWS, Tribal Governments	Completed August 2004
Rat prevention on Pribilofs	TNC, USFWS	On-going
Other Alaskan Projects		
Rat eradication/prevention on Aleutians	USFWS, TNC, WWF	Preliminary; building through 2005, on-ward
Coastal Communities for Science (community-based research and education)	WWF, Hooper Bay, Unalakleet, St. Paul, St. George	2004-2007
Bering Sea Strategic Action Plan	WWF, TNC	2004; then on-going with partners
Improving Fisheries Management in Russia		
Community based fisheries certification in Russia	WWF	On-going
Salmon conservation in Russian marine environment	WWF	2005 -?
Establishing satellite-based VMS in Russia	WWF	On-going
Integrating fisheries enforcement efforts in Russia	WWF	On-going
Seabird bycatch reduction in Russian long-line fishery	WWF	On-going
Analysis of driftnet fisheries in Russia, work to ban practice	WWF	On-going
Commander Islands		
Commander Islands expeditions, film and booklet	WWF	2004-5
Commander Islands conservation plan (?)	WWF, Audubon	?
Improving management on the Commander Islands (technical assistance, travel grants, education, student stipends, etc)	WWF, USFWS	On-going
Other Russian Projects		
Reintroduction of Aleutian Canada Goose in Russia	WWF, others?	?
Polar bear conservation program (community outreach in Russia, advocacy for treaty implementing legislation, advocacy for developing harvest regulations in Russia)	WWF	On-going
Advocacy for establishment of Beringia International Park	WWF, NPS, (others?)	On-going
Support for Wrangel Island Zapovednik (World Heritage site nomination, technical assistance, education booklet)	WWF	2000-2003
Ecotourism development in Chukotka	WWF, WWF Arctic Program	On-going
Developing ecotourism best practices in AMNWR	WWF, Audubon?	2004-2005
Developing regional protected areas in Chukotka coastal areas	WWF	On-going

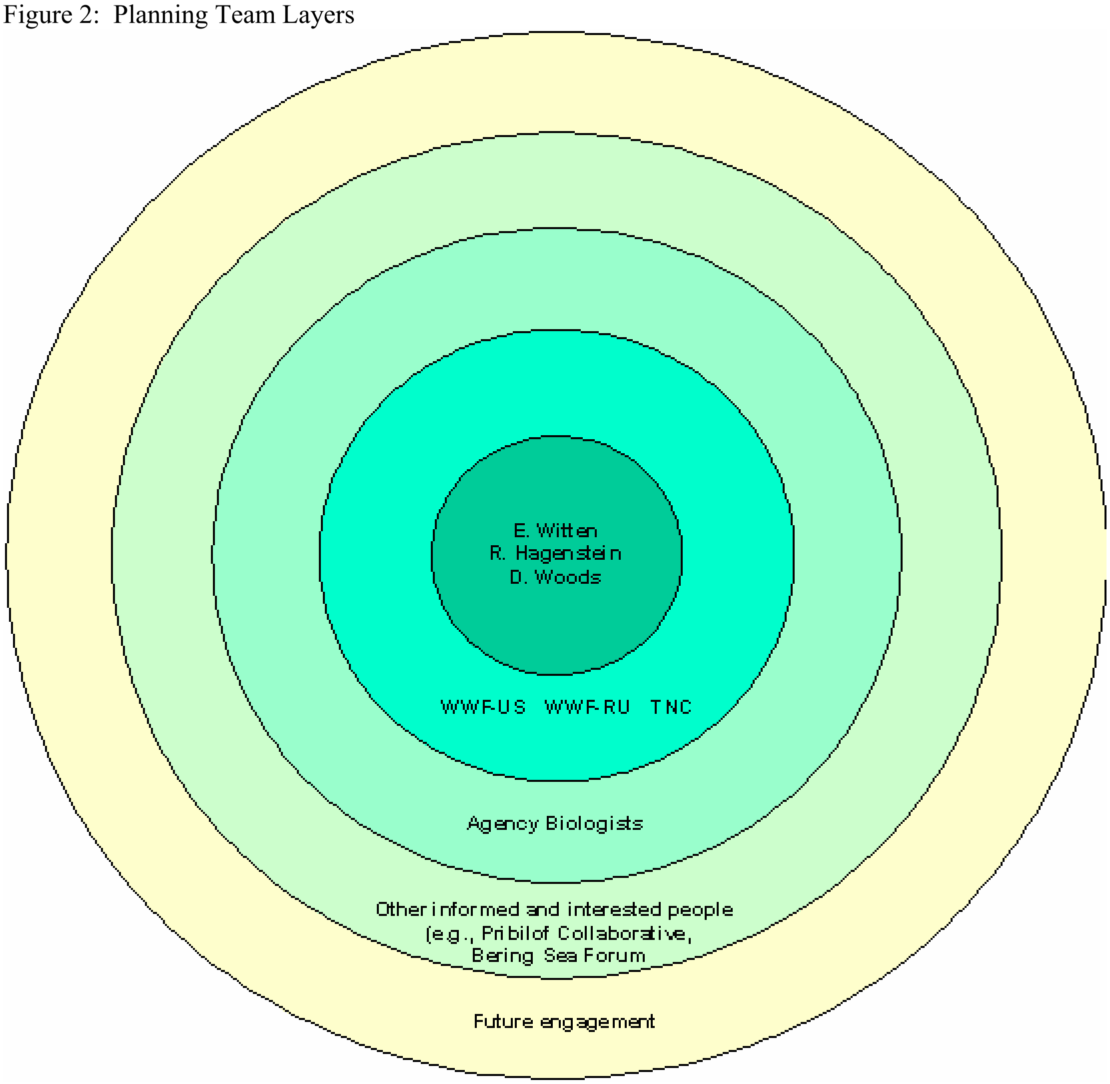
2. PLANNING METHOD

2.1 Planning Team

Planning Team Members

Evie Witten and Denise Woods of WWF Bering Sea Ecoregion Program and Randy Hagenstein of The Nature Conservancy in Alaska comprised the core Planning Team. Margaret Williams (WWF-U.S.); Viktor Nikiforov, Vassily Spiridonov, and Konstantine Zgurovsky (WWF-Russia); and Corrine Smith (TNC) also contributed. We are grateful for the technical input of many Bering Sea Ecoregion science experts (see Section 11 for experts we consulted); we plan to integrate their further participation, as well as the participation of other Bering Sea partners, in future iterations of this Plan.

Figure 2: Planning Team Layers



2.2 Adaptive Management/ Open Standards

WWF, TNC and others in the Conservation Measures Partnership are working to assure the effectiveness of their conservation actions by implementing a common set of adaptive management "open standards" as guidelines for our projects. The standards are meant to provide the principles, tasks, and guidance necessary for the successful implementation of conservation practices; to provide a transparent basis for a consistent and standardized approach to the evaluation of our actions; and to promote and facilitate greater collaboration among conservation organizations. The analytical and iterative components of these standards reflect the adaptive management approach we advocate.

The Open Standards Project Cycle steps are: (see Figure 3, below)

1) **Conceptualize**
    - i) Be clear and specific about the issue to be addressed
    - ii) Understand the context in which your project takes place
    - iii) Create a model of the situation in which your project will take place
2) **Plan**
    - i) Plan your actions
        - (a) Develop clear goals and objectives
        - (b) Strategically select activities that will accomplish your goals and objectives
        - (c) Develop a formal action plan
    - ii) Plan your monitoring and evaluation (M&E)
        - (a) Focus monitoring and evaluation plan on what you need to know
        - (b) Develop a formal M&E plan
3) **Implement**
    - i) Implement Actions
    - ii) Implement M&E plan
4) **Analyze**
    - i) Analyze your M&E plan
    - ii) Analyze why an intervention succeeded or failed
    - iii) Communicate results within project team
5) **Use & Adapt**
    - i) Adapt your action plan and M&E plan based on your results
6) **Communicate**
    - i) Develop a clear dissemination strategy aimed at your audiences
7) **Iterate**
    - i) Revisit steps in the overall process on a regular basis
    - ii) Create a learning and adaptive environment

Figure 3: The Adaptive Management Project Cycle

Conservation Measures Partnership, Open Standards for the Practice of Conservation, 2003

2.3 <u>TNC Enhanced 5-S Methodology</u>

TNC and WWF have been collaborating at the national level for the past several years to develop shared methodologies for conservation planning and to measure the effectiveness of our projects. Our hope is to foster strategic partnerships within our organizations that will leverage our activities and result in greater conservation impact.

The Nature Conservancy uses a standardized methodology to ensure conservation actions are designed to have the greatest impact on preserving species, communities, and ecological systems. The standardized method utilizes the Enhanced 5-S process (the 5-S's stand for "**S**ystems", or targets; "**S**tresses and **S**ources", or threats; "**S**trategies", or actions to address the threats; and "**S**uccess Measures", or monitoring).

The original 5-S process includes the following steps:

1. Identify a limited number of conservation "targets" (species, communities, or ecological systems) that encompass the full suite of biodiversity conservation concerns for a given area.
2. Identify and rank threats to each conservation target. This step includes identification of direct stresses to a target as well as the source(s) of the stresses. Threats are ranked according to their severity, geographic scope, and reversibility.
3. Develop threat abatement strategies (i.e., strategies to reduce the source of a given stress)

In its newest iteration, the 5-S planning process has been refined, or "enhanced" (thus, "Enhanced 5-S" or "E5S") with the following additions:

1) A careful analysis of life history characteristics and ecological processes of the conservation targets (biological features),
2) Identification of key ecological attributes (KEA's: those factors or processes that exert inordinate influence on the persistence of a species or ecosystem),
3) Identification of explicit indicators of the status of the KEA's, with identification of an acceptable range of variation in the status of the KEA's,
4) A more sophisticated threat identification and ranking method, focused on altered KEA's,
5) A mechanism for recording goals, objectives, strategic actions, and action steps, and
6) A monitoring framework for tracking the indicators.

One of the strengths of the E5S process (and resulting planning framework) is that it encourages the creation and adoption of adaptive management techniques (see section 2.2). This framework helps conservation practitioners analyze threats to focal conservation targets, develop strategies to abate the threats, and draft monitoring plans to measure both the conservation status of the target and the effectiveness of the conservation actions. This planning tool was originally developed to aid in strategy development at a site or project scale, with the assumption that the tool is "scalable" to larger geographic areas. WWF and TNC at a national level have asked the Bering Sea projects of both organizations to test whether the E5S planning tool can be used effectively to develop strategies and monitoring needs at an ecoregion-wide scale.

A critical step in the E5S process is identification of targets (biological features) – species, natural communities, and ecological systems that encompass the critical biodiversity of an area. For the distribution of the biological features we selected across the major domains (habitat types) of the Bering Sea, see Table 2 (Section 4). Table 5 (Section 5) lists the key ecological attributes we identified for each biological feature and the ecological indicators we recommend for monitoring the status of each key ecological attribute.

2.4 WWF and TNC Terminology

WWF and TNC utilize different terminology with respect to conservation planning; the terms we use in this Plan are designated with an asterisk.

WWF Term	Timeframe	TNC Term	Timeframe
Vision*	Infinite	Vision*	Infinite
Goals*	Infinite	Desired Status/ Viability Goals	Infinite
Target/ Objective	10 years	Objective*	1-100 years
Milestone	3 years	Strategic Actions* (Programs)	1-5 years
Activity	1-2 years	Action Steps* (Programs)	1-2 years
Biological Feature*		Target	

3. SITUATION ANALYSIS

3.1 Conceptual Model

We chose to develop a visual conceptual model (Figure 4) for several reasons. First, the act of developing the model forced us to think about the causes-and-effects of change to Bering Sea biodiversity, about proximal causes, causal chains, and root causes. One of the short-comings of the E5S workbook is that it does not facilitate thinking about root causes or causal chains (i.e., the workbook recognizes stresses (altered ecological attributes) and sources of the stress, but does not lead to documenting the factors that influence those sources of stress. A flow-chart conceptual model does encourage deeper thinking about root causes.

Second, the conceptual model makes our understanding of causes more explicit and therefore open to evaluation, critique, and refinement.

Third, the conceptual model can be used to identify potential or undocumented or uncertain cause-and-effect relationships. These areas of uncertainty can be used to flag areas for more research.

Fourth, the conceptual model can assist in developing higher leverage strategies to impact a given cause-effect chain.

Finally, the conceptual model provides a means to identify points in the various causal chains where monitoring can or should occur.

For the Bering Sea, we developed the conceptual model shown in Figure 4 by first listing the biological features that were most representative of Bering Sea biodiversity on the right side of the diagram.[1] These are shown as blue boxes in the conceptual model diagram. Next, we identified the proximal factors that may affect one or more targets (i.e., threats); these are shown as yellow boxes. As we had ranked and prioritized threats already in the E-5-S workbook, we focused on a subset of threats that ranked high in scope, severity, and irreversibility. Next, we identified additional factors that influence the threats (yellow boxes). Then we developed objectives for addressing the most important threats (gray ovals). Note that the objectives may be targeted at the biological feature, the proximal threat or farther to left on the causal chain. The red hexagons indicate strategic actions designed to achieve the objectives. Finally, the pink diamonds show points in the system that we feel are important or possible to monitor.

By way of example, seabird populations are an important component of Bering Sea biodiversity. Nesting seabirds have been impacted by rats and fox that have been introduced onto islands that previously lacked terrestrial predators. These new predators have come from intentional introductions (in the case of fox farming) and unintentional

[1] Typically, initial model development happens on a large wall with stick-on cards. We chose to develop the conceptual model directly on the computer using Visio software, projected on the wall through an LCD projector.

introductions of rats via shipwrecks, in off-loaded cargo and fishing gear, and while rat-infested ships are in port. Objectives 5 a-b address rat and fox eradication, prevention of new introductions, and shipwreck response. The strategic action is to develop a partnership with U.S. Fish & Wildlife Service on eradication and prevention. Monitoring of rat presence, seabird recovery, and shipwreck response timing ensures that relevant parts of a cause-and-effect chain are measured over time.

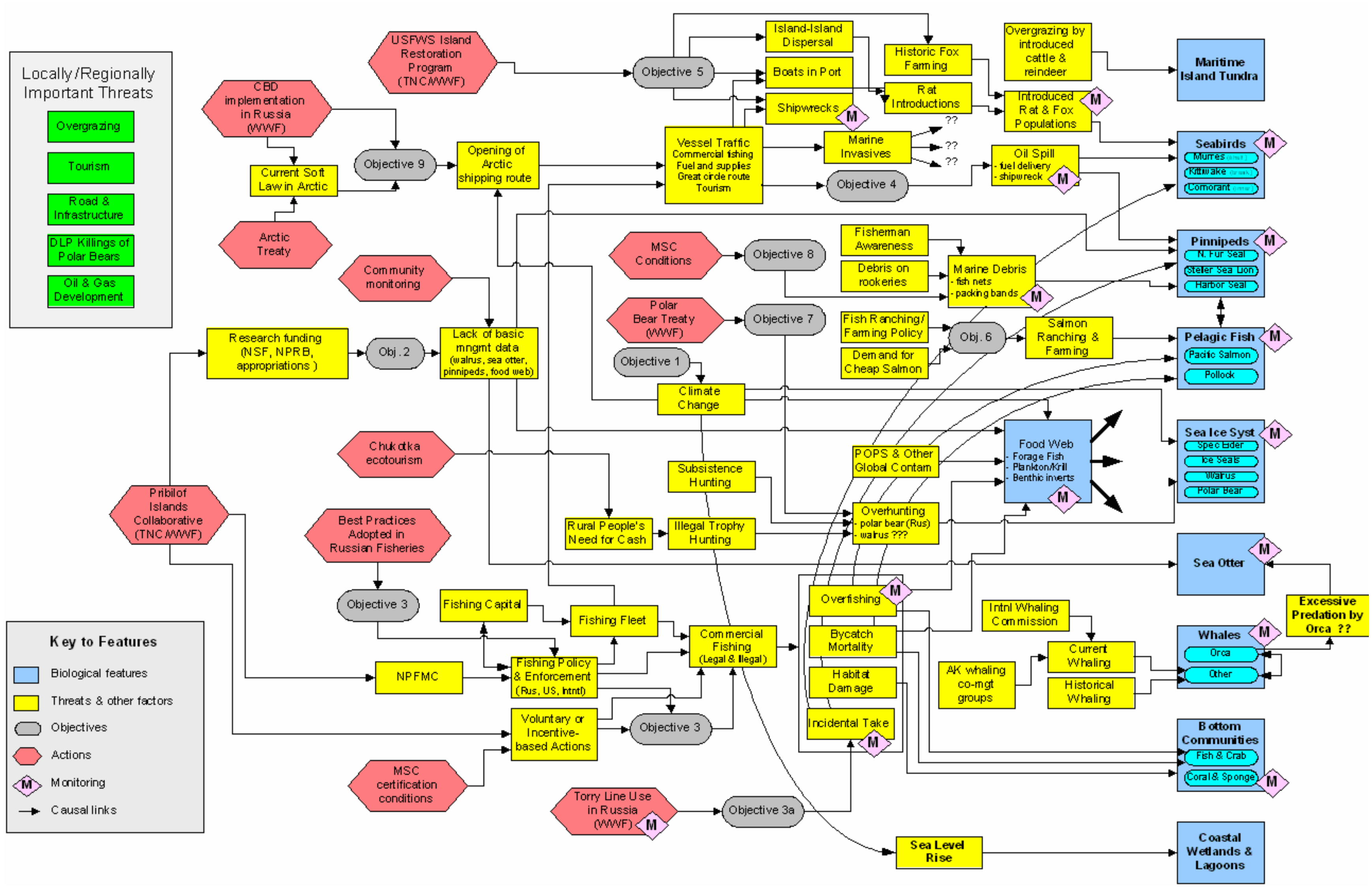


Figure 4. Situation Analysis/ Conceptual Model Diagram for the Bering Sea Ecoregion

4. BIOLOGICAL FEATURES SUMMARY

4.1 Biological Features

As recommended by the E5-S planning methodology, we selected a very limited number of critical targets (or biological features), rather than developing an exhaustive list of every species and community known to exist in the Bering Sea Ecosystem. The assumption here is that one feature can serve as a surrogate or umbrella for many other biological features. Alternatively, rather than selecting many species of fish as individual conservation targets and developing threat assessments and strategies for each species, one could select a key habitat or suite of habitats critical to a particular life stage of many fish species (e.g., coral/sponge communities) and develop a threat assessment and strategies for the habitat. We employed both methods when selecting the ten biological features for this Plan.

Complete summaries of life history, population status, threats to and research needs for select biological features (i.e. those that will be targeted first) is in Part II, Section 3 of this Plan. Below, Table 2 shows the distribution of the biological features we selected across the major domains (habitat types) of the Bering Sea; Table 3 lists the species subsumed under each biological feature and includes our justification for their inclusion in this Plan; and Table 4 lists the biological features that occur in the Priority Areas for conservation in the Bering Sea Ecoregion (see Section 1.4 "Ecoregion-Based Conservation in the Bering Sea" for a map of these areas).

Table 2: Biological Features for Bering Sea Conservation

Biological Features	Distribution: Northern Bering Sea	Southern Bering Sea	Inner Domain (nearshore)	Outer and Middle Domain (shelf)	Shelf Break Domain	Oceanic Domain	Sea Ice Domain	Straits	Terrestrial/ Island Domain
Seabirds Kittiwakes Murres Cormorants	✓	✓	**Cormorant**	**Murres?**	**Kittiwake**	**?**			**Nesting**
Southern Bering Sea Pinnipeds Northern Fur Seal Steller Sea Lion Harbor Seal	✓	✓	**NFS and SSL pups, Harbor seal**	**SSL, NFS**	**SSL, NFS**	**NFS**			**Pupping and breeding**
Pelagic Fishes Pacific Salmon Pollock	✓	✓				✓		**High concen-trations**	
Sea Ice Ecosystem Polar Bear Pacific Walrus	✓			✓			✓		
Sea otter		✓	✓						
Whales Orca Gray Beluga	✓	✓		✓	✓	✓	✓		
Bottom Communities	✓	✓	**Aleutian Domain?**	✓	✓				
Coastal Lagoons & Freshwater Wetland Systems	✓	✓	**Lagoons**						**Freshwater wetlands**
Maritime Insular Tundra	✓	✓							✓

Table 3: Biological Features, Subsumed Biological Features, and Justification for Selection

Biological Feature	Reason for Selecting Biological Feature	Other Biological Features That Will Benefit From Conservation of This Feature
Seabirds Kittiwakes Murres Cormorants	Long-lived, high level of current monitoring investment, different foraging strategies act as indicators for other species and processes. All are fish-eating birds and therefore most sensitive to change in forage fish populations: Kittiwakes – forage at shelf break Murres – forage over shelf Cormorant – forage nearshore	Other seabird species populations, forage fish populations
Southern Bering Sea Pinnipeds Northern Fur Seal Steller Sea Lion Harbor Seal	Declining populations, top level predators, high percentage of global population of northern fur seal breeds in the Bering Sea	Forage fish and pelagic fish populations
Pelagic Fish Pacific Salmon Pollock	Large percentage of total biomass in the Bering Sea, important link in the food web. Salmon: Link marine and terrestrial realms, important subsistence and commercial resource, high level of current monitoring investment Pollock: Large percentage of fish biomass, target of major fishery	Other pelagic fish species populations
Sea Ice Ecosystem	Regulates sea surface temperatures, provides critical habitat for multiple and varied species, effect of climate change measurable	Spectacled Eider Ringed, Spotted, bearded and ribbon seals Walrus, Polar Bear Bowhead and Beluga whales
Sea Otter	Keystone species, in decline throughout Aleutians.	Kelp forest communities Fish species that rear in kelp
Whales Orca, Grey, Beluga, Sperm, Right, Fin	Diverse foraging strategies, long-lived, many populations in Orca: top level predator	Other Bering Sea cetaceans
Bottom Communities	Provide habitat for many fish species, coral & sponge gardens are highly productive and contain unique species assemblages, are susceptible to damage from fishing activities.	Rockfish Crab Coral & sponge gardens
Coastal Lagoons & Freshwater Wetland Systems	Productive foraging and nesting habitats for waterfowl, important rearing habitat for juvenile fish and shellfish	Waterfowl Juvenile fish and shellfish Shorebirds Herring
Maritime Insular Tundra	Provides nesting habitat for upland rock sandpipers, snow bunting and other passerines, threatened by introduced reindeer and cattle and road and infrastructure development	Pribilof rock sandpiper, other ground nesting birds, endemic small mammals (e.g., Pribilof Shrew)

Table 4: Biological Features in Priority Areas of the Bering Sea Ecoregion

Highest Priority Area	Map Id	Biological Features (Targets): Seabirds	Southern Bering Sea Pinnipeds	Pelagic Fishes	Sea Ice Ecosystems	Sea Otter	Whales	Bottom Communities	Coastal Lagoons and Freshwater	Maritime Insular Tundra
Bering Strait	1	✓			✓		✓		✓	
Wrangel and Herald Islands	2	✓			✓		✓		✓	
Kolyuchin Bay and Coast	3						✓		✓	
Sireniki Polynya	4	✓			✓		✓			
Anadyr River Estuary	5			✓					✓	
Cape Navarin and Meynypil'gyno River System	6	✓		✓	✓		✓		✓	
St. Lawrence Island	7	✓			✓		✓			✓
Yukon-Kuskokwim Delta and Nunivak Island	8		✓	✓	✓		✓		✓	✓
Golden Triangle	9	✓	✓	✓			✓		✓	✓
Bristol Bay	10	✓		✓	✓	✓	✓		✓	
Commander Islands	11	✓	✓			✓	✓	✓		✓
Aleutian Islands	12	✓	✓	✓		✓	✓	✓	✓	
Karaginsky and Olyutorsky Bays	13	✓	✓	✓	✓		✓		✓	✓
Eastern and Northern Norton Sound	14 & 15	✓	✓				✓	✓	✓	
Kasegaluk Lagoon and Ledyard Bay	16	✓	✓				✓		✓	
Aleutian Basin	17			✓			✓			
Bering Sea Shelf Break	18	✓	✓	✓			✓	✓		
Kronotsky Peninsula	19	✓	✓							
Kamchatsky Peninsula	20		✓	✓					✓	

Data Source: Ecoregion-Based Conservation in the Bering Sea (1999)

5. VIABILITY SUMMARY

The table that appears on the following pages (Table 5) indicates the *key ecological attributes* we identified for each biological feature and the ecological *indicators* we recommend for tracking the status of each attribute. It also contains the current viability ratings for the biological features (based on the status of its indicators) and documentation of the sources of data we used for determining the ratings. The information contained in this table is also available in text format, following each biological feature chapter in Part II (Section 3).

Because TNC and WWF are actively engaged in projects to conserve seabird and pinniped populations, we have included more detail on these biological features. Other features contain less detail because they 1) are not species we are currently focusing our programs on or 2) the relevant data are not compiled in a readily accessible format. Details regarding the current status of indicators for these features should be addressed in future iterations if this plan

Table 5: Assessment of Target Viability

	Conservation Target (Biological Feature)	Category	Key Attribute	Indicator	Indicator Ratings (**Bold = Current**, *Italics = Desired*): Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
1	Seabirds	Condition	Combined long term means (5 yr rolling average) for productivity & population	Cormorants: % breeding pairs producing chicks, population count	<20% below LT mean pop. & productivity	<20% below LT mean pop. or productivity	***Stable pop. + stable or >20% above LT mean for productivity***	> 20 % above LT mean for population + stable or > 20% above LT mean productivity		Good	Good	Dec 04 based on 2001 USFWS data	
1	Seabirds	Condition	Combined long term means (5 yr rolling average) for productivity & population	Kittiwake: % breeding pairs producing chicks, population count	<20% below LT mean pop. & productivity	<20% below LT mean pop. or productivity	***Stable pop. + stable or >20% above LT mean for productivity***	> 20 % above LT mean for population + stable or > 20% above LT mean productivity		Good	Good	Dec 04 based on 2001 USFWS data	
1	Seabirds	Condition	Combined long term means (5 yr rolling average) for productivity & population	Murres: % breeding pairs producing chicks, population count	**<20% below LT mean pop. & productivity**	<20% below LT mean pop. or productivity	*Stable pop. + stable or >20% above LT mean for productivity*	> 20 % above LT mean for population + stable or > 20% above LT mean productivity		Poor	Good	Dec 04 based on 2001 USFWS data	

Table 5: Assessment of Target Viability

					Bold = Current	Indicator Ratings		Italics = Desired					
Conservation Target (Biological Feature)		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
2	Pinnipeds	Landscape Context	Prey availability	Female fur seal trip distance and duration	data needed	data needed	data needed	data needed					
2	Pinnipeds	Landscape Context	Prey availability	NFS pup weight	data needed	data needed	data needed	data needed					
2	Pinnipeds	Landscape Context	Prey availability	Number (%) NFS pup starvations/year	data needed	data needed	data needed	data needed					
2	Pinnipeds	Size	Population size & dynamics	Harbor seal population growth rate	>5% per yr decline	**0-5% per yr decline**	*0-5% per yr growth*	>5% per yr growth		Fair	Good	Jan-01	
2	Pinnipeds	Size	Population size & dynamics	Northern fur seal bull counts	<10 K	**10-15 K**	*15-20 K*	> 20 K		Fair	Good	Oct-03	
2	Pinnipeds	Size	Population size & dynamics	Northern fur seal pup counts	<100 K	**100-200 K**	*200-300 K*	>300 K		Fair	Good	Oct-04	
2	Pinnipeds	Size	Population size & dynamics	Number of northern fur seal caught incidentally in commercial fisheries/year	>16,000	1,600-16,000	160-1,600	***<160***		Very Good	Very Good	Oct-03	
2	Pinnipeds	Size	Population size & dynamics	Percent of female northern fur seals entangled/year	>0.1	**0.1-0.01**	*0.01-0.001*	<.001		Fair	Good	Oct-04	
2	Pinnipeds	Size	Population size & dynamics	Steller sea lion adult/juvenile counts	**<11**	11-18	*18-44*	>44		Poor	Good	Oct-04	

Table 5: Assessment of Target Viability

	Conservation Target (Biological Feature)	Category	Key Attribute	Indicator	**Bold = Current** Indicator Ratings *Italics = Desired*: Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
3	Pelagic Fish	Condition	Sustainability of Pollock fishery	Marine Trophic Index (MTI)	<-0.1	> -0.1- <0.05	**>-0.05<0**	*0*		Good	Very Good	Nov-03	
3	Pelagic Fish	Size	Pollock biomass	Pollock biomass as % of unfished biomass	<B 20%	B 20-35%	B 35-45%	***>B 45%***		Very Good	Very Good	Nov-04	
3	Pelagic Fish	Size	Population size & dynamics	Percentage of streams meeting salmon escapement goals			**good management generally on US side**			Good			
4	Sea Ice Ecosystem	Landscape Context	Prey availability	Polar bear body weight, physiological parameters, blood chemistry	Data not available	Data not available	Data not available	Data not available					
4	Sea Ice Ecosystem	Landscape Context	Prey availability	Walrus blubber thickness, blood chemistry	Data not available	Data not available	Data not available	Data not available					
4	Sea Ice Ecosystem	Landscape Context	Sea ice habitat integrity	Aerial extent and timing of pack ice (km2) over shelf; winter maximum and summer minimum		**OK today but declining rapidly in extent, thickness, structure, and duration**				Fair			
4	Sea Ice Ecosystem	Landscape Context	Sea ice habitat integrity	Amount (km2) of multi-year ice vs. annual ice		**Declining in thickness**				Fair			

Table 5: Assessment of Target Viability

#	Conservation Target (Biological Feature)	Category	Key Attribute	Indicator	Indicator Ratings (**Bold = Current**, *Italics = Desired*): Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
						and amount of multi-year ice							
4	Sea Ice Ecosystem	Size	Population size & dynamics	Polar bear population size									
5	Sea Otter	Condition	Population structure & recruitment	population counts	**> 18,500**	18,500 - 37,000	*37,000 - 74,000*	>74,000		Poor	Good		
5	Sea Otter	Size	Population size & dynamics	Sea otter adult/pup ratios	tbd	tbd	tbd	tbd					
6	Whales	Size	Population size & dynamics	Beluga population size			**20,000, stable**			Good	Very Good	Nov-03	
6	Whales	Size	Population size & dynamics	Fin whale population size	**ESA listing = Endangered**	ESA listing = threatened	Removed from ESA	*Not "depleted" under MMPA*		Poor	Very Good	Nov-03	
6	Whales	Size	Population size & dynamics	Gray whale population size	ESA listing = endangered	ESA listing = threatened	**Removed from ESA**	*Not "depleted" under MMPA*		Good	Very Good	Nov-94	
6	Whales	Size	Population size & dynamics	Orca population size	tbd	tbd	tbd	*tbd*			Very Good	Nov-03	
6	Whales	Size	Population size & dynamics	Right whale population size	**ESA listing = endangered**	ESA listing = threatened	*Removed from ESA*	Not "depleted" under		Poor	Good	Nov-04	

Table 5: Assessment of Target Viability

	Conservation Target (Biological Feature)	Category	Key Attribute	Indicator	Indicator Ratings (**Bold = Current**, *Italics = Desired*): Poor	Fair	Good	Very Good	Current Indicator Status	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
								MMPA					
6	Whales	Size	Population size & dynamics	Sperm whale population size	**ESA listing = endangered**	ESA listing = threatened	*Removed from ESA*	Not "depleted" under MMPA		Poor	Good	Nov-04	
7	Coral/sponge Gardens	Size	Size, extent, and architecture of coral/sponge communities	amount (pounds) of corals and sponges in trawl bycatch		**> 500,000 lbs. annually**	*< 500,000 lbs. annually*			Fair	Good	Nov-03	Jan-08
8	Bottom Dwelling Fish & Crab	Size	Population size & dynamics	Nearshore species population	tbd	tbd	tbd	tbd					
8	Bottom Dwelling Fish & Crab	Size	Population size & dynamics	Shelf break species population	tbd	tbd	tbd	tbd					
8	Bottom Dwelling Fish & Crab	Size	Population size & dynamics	Shelf species population	tbd	tbd	tbd	tbd					

Conservation Target Enter # of Target		Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Rating	Desired Rating	Date of Current Rating	Date for Desired Rating
9	Coastal lagoons & freshwater wetland systems	Condition	Fish nursery function	numbers of juvenile fish from sampling								
9	Coastal lagoons & freshwater wetland systems	Condition	Migratory bird feeding and resting	Fall bird counts								
9	Coastal lagoons & freshwater wetland systems	Condition	Waterfowl breeding	Breeding bird surveys								
9	Coastal lagoons & freshwater wetland systems	Size	Size / extent of characteristic communities / ecosystems	Acres lost to facilities, roads, and other development								
10	Maritime insular tundra	Condition	Community composition and structure	% of area impacted by grazing measured by plot surveys								
10	Maritime insular tundra	Condition	community composition and structure	Change in abundance of climate indicator plant species								
10	Maritime insular tundra	Condition	Community composition and structure	Presence/number of non-native plant species in plot data								
10	Maritime insular tundra	Size	Size / extent of characteristic communities / ecosystems	Acres lost to facilities, roads, and other development								

6. THREATS SUMMARY

6.1 Threats Summary Tables

As prescribed by the E5S methodology, we evaluated the various stresses to the conservation targets and sources of those stresses and ranked the stresses/sources according to severity, geographic scope, and reversibility. We also ranked the threats according to gap (i.e. not currently addressed), fit with WWF and TNC missions, and feasibility of addressing within the ecoregion. Tables ranking the top ten threats in the Bering Sea (Table 6), threats by Priority Area (Table 7), and a Summary of Threats to the Biological Features (Table 8) are below. Please note that not all threats listed for each biological feature on Table 7 appear in the Threats Summary Table produced by the E5S tool (Table 8).

Table 6. Bering Sea Threats (Ranked by Planning Team)

Threat	Current Importance	Future Importance	TNC/WWF Do-ability*	Gap	TNC/WWF Fit	TOTAL Points	Ranking
Introduced Rat & Fox Pops	8	7	6	7	10	38	1
Commercial Fishing	9	4	5	6	9	33	2
Oil Spills	7	8	9	5	2	31	3
Salmon Ranching / Farming	4	5	7	9	6	31	4
Marine Debris	6	2	10	3	8	29	5
Marine Invasives	1	6	4	10	7	28	6
Climate Change	10	10	2	2	3	27	7
Overhunting	5	1	8	8	5	27	8
Shipping Routes	2	9	3	4	4	22	9
POPS etc.	3	3	1	1	1	9	10

*Feasibility given resources likely to be available during next 5 years

Table 7: Threats to Biological Features in Priority Areas of the Bering Sea Ecoregion

Highest Priority Area	Map Id	Threat: Introduced Rat, Fox and / or Ungulates Populations	Fisheries Mismanagement	Oil Spills / Development	Salmon Farming	Marine Debris / Entanglement	Marine Invasives	Climate Change	Overhunting / Poaching	Shipping Routes	POPS / Other Contaminants
Bering Strait	1	✓		✓				✓		✓	
Wrangel and Herald Islands	2							✓		✓	
Kolyuchin Bay and Coast	3			✓				✓		✓	
Sireniki Polynya	4			✓				✓		✓	
Anadyr River Estuary	5			✓				✓		✓	✓
Cape Navarin and Meynypil'gyno River System	6			✓				✓		✓	✓
St. Lawrence Island	7			✓				✓			✓
Yukon-Kuskokwim Delta and Nunivak Island	8	✓	✓					✓		✓	✓
Golden Triangle	9	✓	✓			✓		✓		✓	
Bristol Bay	10		✓	✓		✓		✓		✓	
Commander Islands	11		✓					✓	✓		
Aleutian Islands	12	✓	✓			✓		✓			
Karaginsky and Olyutorsky Bays	13							✓	✓		
Eastern and Northern Norton Sound	14 & 15		✓	✓				✓		✓	
Kasegaluk Lagoon and Ledyard Bay	16			✓				✓			
Aleutian Basin	17		✓					✓	✓		
Bering Sea Shelf Break	18		✓					✓			
Kronotsky Peninsula	19			✓				✓			
Kamchatsky Peninsula	20		✓			✓		✓		✓	✓

Data Source: Ecoregion-Based Conservation in the Bering Sea (1999)

	Table 8: Summary of Threats to Biological Features Project-specific threats	Seabirds	Pinnipeds	Pelagic Fish	Sea Ice Ecosystem	Sea Otter	Whales	Coral/sponge Gardens	Bottom Dwelling Fish & Crab	Overall Threat Rank
1	Climate change	High	High	High	Very High	Very High	-	-	High	Very High
2	Lack of basic management data	-	Medium	-	High	Very High	Medium	Medium	-	High
3	Excessive predation	-	-	-	-	Very High	-	-	-	High
4	Oil spill	High	Medium	Medium	Medium	High	-	-	-	High
5	Competition with fisheries	High	High	-	-	-	-	-	-	High
6	Overfishing	-	-	Medium	-	-	-	-	High	Medium
7	Fisheries	-	-	-	-	-	-	High	-	Medium
8	Introduced predators	High	-	-	-	-	-	-	-	Medium
9	Commercial whaling (historic)	-	-	-	-	-	High	-	-	Medium
10	Contaminants	Medium	Medium	-	-	-	-	-	-	Medium
11	Fishing bycatch mortality	Medium	-	Medium	-	-	-	-	-	Medium
12	Damage from fishing gear	-	-	-	-	-	-	-	Medium	Low
13	Disease, genetic dilution, and competition from aquaculture	-	-	Medium	-	-	-	-	-	Low
14	Road & infrastructure development	Medium	-	-	-	-	-	-	-	Low

15	DLP killings (polar bears)	-	-	-	Medium	-	-	-	-	Low
16	Overhunting	-	-	-	Medium	-	-	-	-	Low
Threat Status for Targets and Site		High	High	Medium	High	Very High	Medium	Medium	High	Very High

6.2 Threats by Area (Threats Maps)

The following maps illustrate the locations of top threats to the biological features in the Bering Sea Ecoregion (Prepared by Randy Hagenstein, TNC Alaska).

Figure 5. Areas of the Bering Sea Ecoregion Threatened by Climate Change

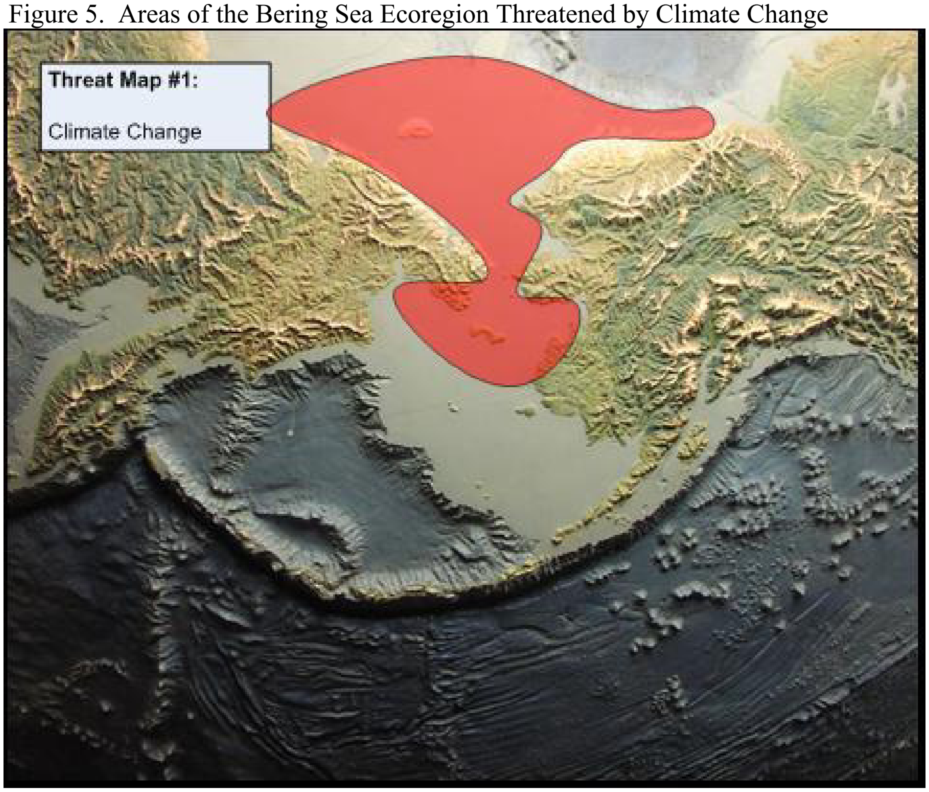


Figure 6. Areas of the Bering Sea Ecoregion Threatened by Marine Invasives

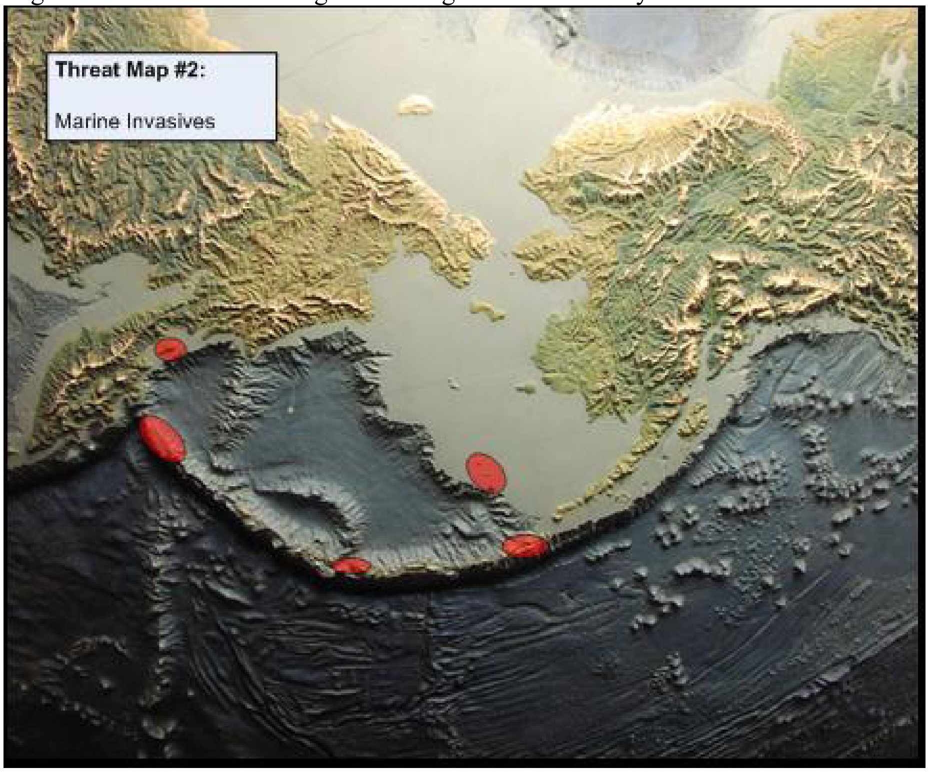


Figure 7. Areas of the Bering Sea Ecoregion Threatened by Oil Spills

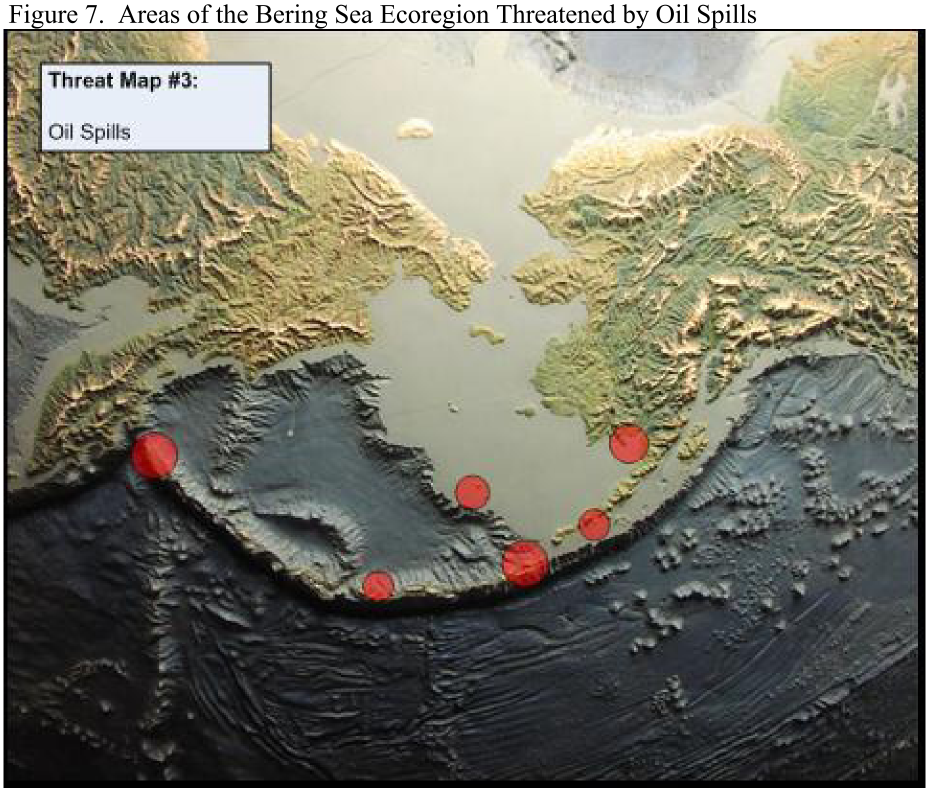


Figure 8. Areas of the Bering Sea Ecoregion Threatened by Marine Debris

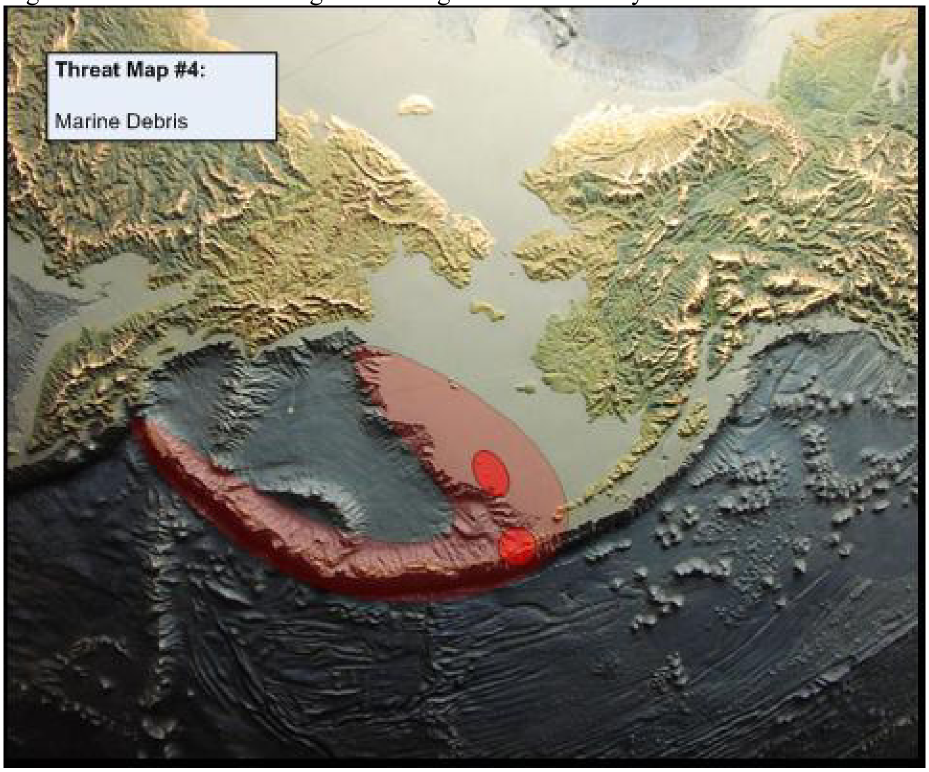


Figure 9. Areas of the Bering Sea Ecoregion Threatened by Fisheries

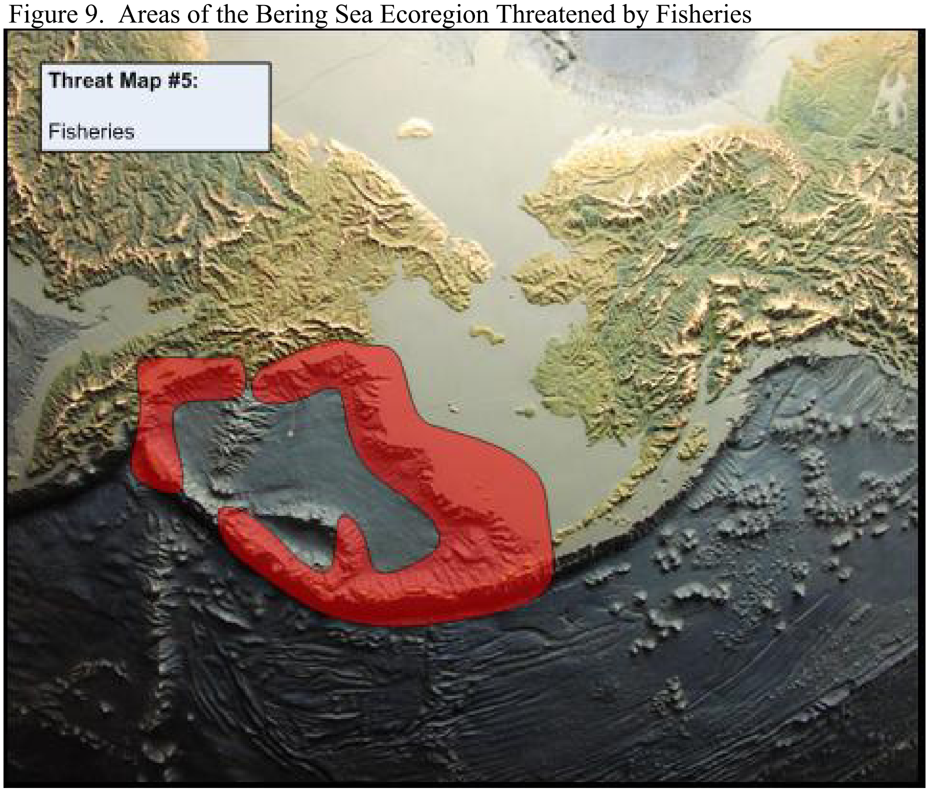


Figure 10. Areas of the Bering Sea Ecoregion Threatened by Introduced Predators

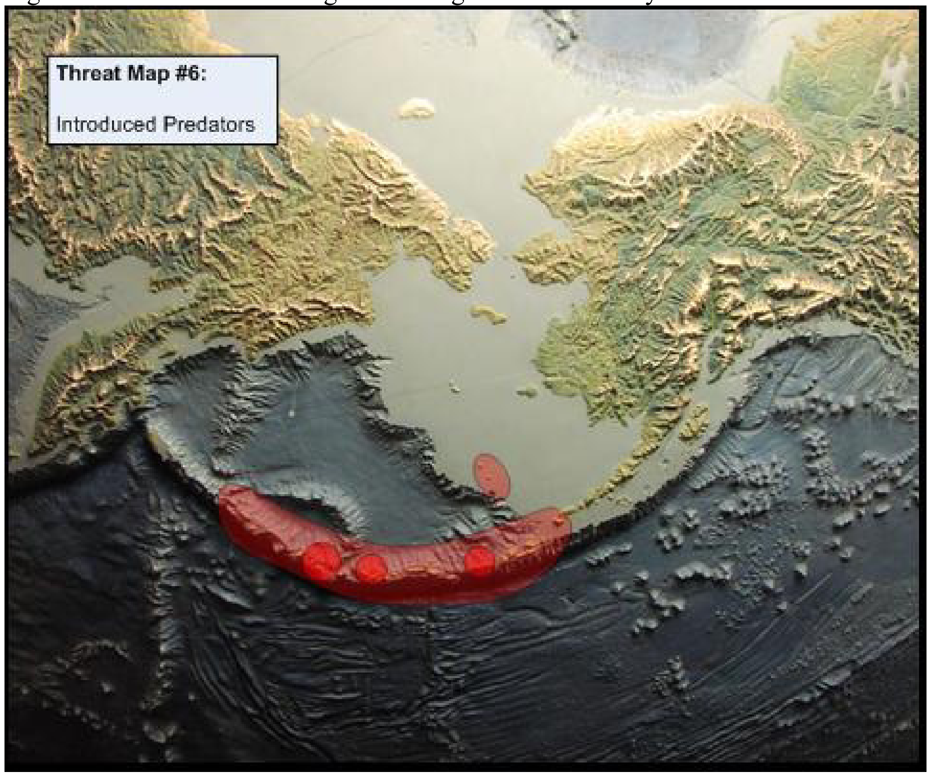
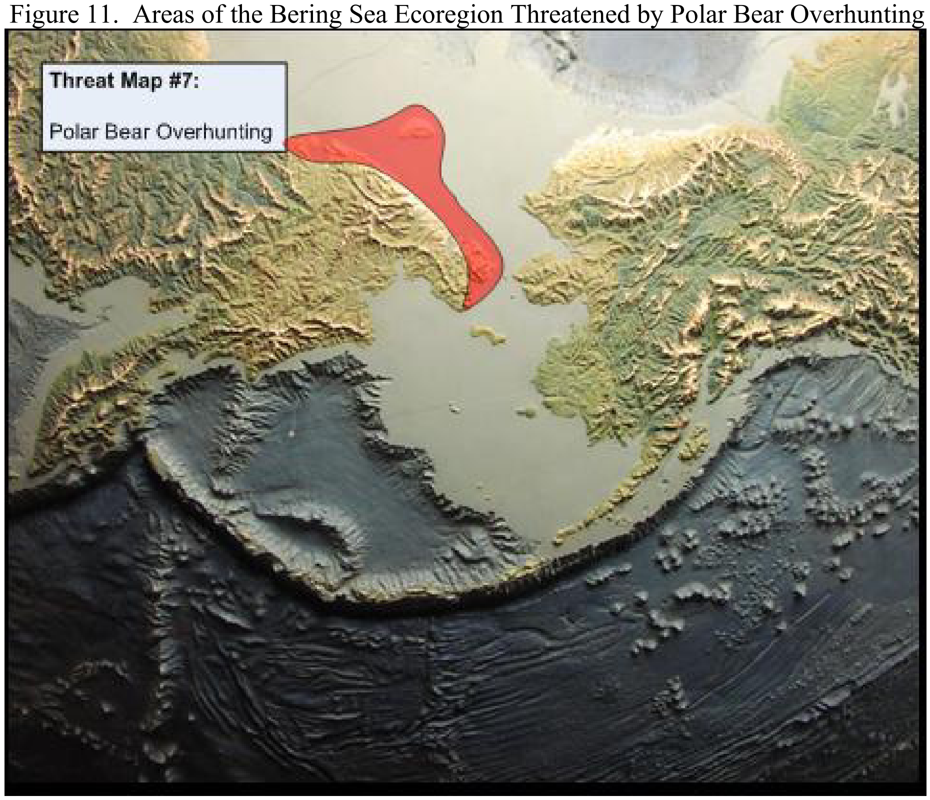


Figure 11. Areas of the Bering Sea Ecoregion Threatened by Polar Bear Overhunting



6.3 Threats to Select Biological Features

The status of various threats, as related to select biological features, is summarized below. The complete text summarizing life history, population status, threats to and research needs for select biological features (i.e. those that will be targeted first) is in Part II, Section 3 of this Plan.

OVERARCHING

Climate Change

The Bering Sea is experiencing a northward biogeographical shift in response to increasing temperatures and atmospheric forcing. Overland and Stabeno (2004) have observed that mean summer temperatures near the Bering Sea shelf are 2 degrees (C) warmer for 2001-2003 compared with 1995-1997. In the coming decades, this warming trend is expected to have major impacts on the region's arctic species, at all levels of the food web: plankton, fish, crabs, seabirds, ice dependent polar bears and walrus, whales and other biological features targeted by this plan (Kelly 2001, Moore et al. 2003, Otto and Stevens 2003, Overland and Stabeno, 2004).

SEABIRDS

Commercial fisheries interactions

Competition for prey

Seabirds are reproductively constrained by the distance between their breeding grounds on land and feeding zones at sea (Weimerskirch and Cherel 1998). They must have access to prey within efficient foraging range of the breeding colony in order to raise their chicks successfully (Piatt and Roseneau 1998, Suryan et al. 2000). If food supplies are reduced below the amount needed to generate and incubate eggs, or the specific species and size of prey needed to feed chicks is unavailable, local reproductive failure is likely to occur (Croxall and Rothery 1991; Anderson et al. 1992; Hunt et al. 1996; Bukucenski et al. 1998). Additionally, because seabirds may impact fish stocks around colonies in summer (Birt et al. 1987), they are vulnerable to factors that reduce forage fish stocks in the vicinity of colonies (Monaghan et al. 1994). Bering Sea commercial fisheries remove millions of metric tons of fish per year (Guttormsen et al. 1992). Although Bering Sea fisheries operate between September and April and thus do not usually compete directly with breeding seabirds for prey items, there is potential overlap with fisheries effort during the egg-laying and late chick rearing and fledging portions of the breeding season for late-breeding species (e.g. kittiwakes). Indirect effects of fisheries on seabirds include disturbance by boats, alteration of predator-prey relationships among fish species, introduction of rats (below) and incidental bycatch (NPFMC 2000).

Incidental bycatch

Seabirds are incidentally caught and killed in all types of fishing operations (Jones and DeGange 1988). Between 1989 and 1999, longline gear accounted for 90 percent of seabird bycatch, trawls for 9 percent and pots for 1 percent (Whol et al 1995). Feeding behaviors may affect susceptibility of birds to bycatch in different gear types: surface-feeding and shallow-diving birds like gulls, fulmars, and albatross are frequently caught in longlines, while murres and other alcids are most frequently caught in trawl gear while foraging in the water column or near the sea bottom (Melvin et al 1999). Estimates of annual seabird bycatch for the Alaska groundfish fisheries indicate that approximately 14,500 seabirds are incidentally caught in the Bering Sea each year, mostly fulmars and gulls (NPFMC 2000). In Russia, a large Japanese drift net fishery for salmon accounted for approximately 160,000 drowned seabirds per year from 1993 to 1997 (Artyukhin and Burkanov 2000). Fisheries bycatch mortality can significantly affect seabird species: the driftnet salmon fishery in Russia is considered by some the single most important threat for Thick-billed Murres in the western Bering Sea, and the loss of members of rare species such as Short-tailed Albatross (*Diomedea albatrus*) is certainly significant (Artyukhin and Burkanov 2000).

Introduced predators

Many seabird species place their nests on ledges and crevices of steeply vertical sea cliffs, in order to protect their eggs and chicks from terrestrial mammalian predators. Numerous extinctions and drastic reductions in seabird populations have been caused by the intentional and unintentional introduction of nonnative mammalian predators to seabird nesting habitats, especially on islands where they did not evolve with such a threat (e.g. Jones and Byrd 1979; Moors and Atkinson 1984; Burger and Gochfeld 1994). On islands throughout the Bering Sea, introduced predators like fox, mink, and Norway rats prey on seabird eggs and chicks with devastating results, particularly for ground-nesters such as storm petrels, murrelets, auklets, and puffins (Bailey 1990; Bailey and Kaiser 1993; Kondratyev et al. 2000b). The potential introduction of rats to the Pribilof Islands poses a serious threat to Red-legged Kittiwakes in particular: 80 percent of the world's population breeds on St. George Island alone (A. Sowls, pers. comm.).

Oil spills

Many seabird species are extremely vulnerable to the effects of pollution, especially oil spills. Mortality primarily results from hypothermia and malnutrition after oiled feathers lose their insulating properties; some oil is also ingestion during preening, which may affect reproductive capacity (Kahn and Ryan 1991). Alcids (Thick-billed and Common Murres in particular) are particularly vulnerable to oil spills (the 1989 *Exxon Valdez* oil spill resulted in the death of at least 185,000 murres, the largest murre kill yet reported; Piatt and Ford 1996), owing largely to the species' large, dense concentrations in coastal habitats (coincident with major shipping channels) and their persistent presence on the water (Ainley et al. 2002).

NORTHERN FUR SEALS

Commercial fisheries interactions

Competition for prey

The effect of removing potential fur seal prey by commercial fisheries in the North Pacific Ocean and eastern Bering Sea is unknown (NMFS 1993). Several important fur seal prey species are the target of commercial fisheries on the continental shelf of the Bering Sea; in combination, these fisheries remove millions of metric tons of fish (Guttormsen et al. 1992), some of which may influence the availability and abundance of food to northern fur seals. However, for the most part, these fisheries target larger fish than are preferred by fur seals (Sinclair 1988; Wespestad and Dawson 1992). The complexity of ecosystem interactions and limitations of data and models make it difficult to determine how fishery removals have influenced fur seals and other marine mammals (Lowry et al. 1982; Loughlin and Merrick 1989).

Entanglement in fishing gear

Although the amount of trawl webbing debris in the Bering Sea may be diminishing (Fowler et al. 1989), fur seals still become entangled in and die in marine debris, principally trawl webbing, packing bands, and monofilament nets, and these same items litter the beaches fur seals use for breeding. Young seals may or may not be more susceptible to entanglement than adult seals (Trites 1992), but the survival of young seals is known to be negatively correlated with entanglement rate (Fowler 1985) and it is clear that entanglement has contributed to the overall mortality in, and possibly the decline of, fur seal populations (NMFS 1993).

Incidental take/ bycatch

While at sea, northern fur seals are sometimes unintentionally caught and killed by commercial fishing gear. The number of fur seals taken incidental to commercial fisheries recently has been relatively low and has declined with a decline in overall fishery effort. It is unlikely that the effect of incidental take in domestic fisheries during the period of the greatest decline of fur seals was significant (Fowler 1982).

Human disturbance and coastal development

Disturbance from repeated human intervention onto breeding rookeries, increasing vessel traffic close to shore, and low flying aircraft are all potential disturbances that might affect the long-term use of a rookery area (NMFS 1993). Although there are few data on the effects of human activities (such as harbor development) on fur seals, some short-term studies suggest little or no effect from brief disturbance episodes (Gentry et al. 1990). However, the effect of chronic, long-term disturbance is unknown.

Petroleum transport/ oil spills

Fur seals are vulnerable to the physiological effects of oiling and subsequent loss of control of thermal conductance (Wolfe 1980). Any oil spill from a vessel near areas where fur seals concentrate to breed (i.e. near the Pribilof Islands) or migrate could thus cause significant direct morality (Reed et al. 1987). During migration into (spring) and out of (late fall-early winter) the Bering Sea, fur seals are concentrated at passes through the Aleutian Islands; one of the most common routes taken is through Unimak Pass, the same route favored by most large vessels in the region. Fur seals are also vulnerable to oil spills during their southern migration along the heavily trafficked coasts of Washington, Oregon, and California (NMFS 1993).

PACIFIC SALMON

Over the past 200 years, the cumulative effects of overfishing, poor fishery and hatchery practices, human development, unfavorable climate, and environmental degradation have resulted in the decline or extirpation of many natural salmon populations, especially in the Pacific Northwest. Primary threats to salmon in the Bering Sea include: intense commercial, recreational, and subsistence fishing; estuarian and freshwater habitat alteration; competition with invasive species; effects from salmon farming and ranching; diseases and parasites; and climate change (Lackey 2003, Overland and Stabeno 2004).

SEA ICE ECOSYSTEM (POLAR BEAR)

Global Climate Change

Because they are dependent on sea ice, polar bears are vulnerable to the effects of global climate change and subsequent alteration of sea ice habitats (Stirling and Derocher 1993; S. Schliebe, pers. comm.).

Illegal harvest/ overharvest

Polar bear skins and gall bladders have substantial value on the world market. Recent reports of unregulated and illegal harvests in the Chukotka district of Russia are cause for concern, particularly because the magnitude of the kill is unknown and the size of the population is not known with certainty (S. Belikov, A. Boltunov, N. Ovsyankov; pers. comm.). Some Russian experts estimate that as many as 100-200 bears were harvested annually in recent years. Although the main motivation for taking polar bears in Russia is for food, many of the hides from these animals are entering commercial markets illegally and are acting to fuel additional harvest demand. In the Alaska Chukchi Sea, a 50 percent reduction in harvest between the 1980's and 1990's has been detected (Schliebe et al. 1998). The Alaska Native subsistence harvest removes approximately 90 bears per year; harvests at this level are believed to be sustainable (USFWS 1994).

Industrial activity

Oil and gas development and transportation

Human activities in the Arctic, particularly those related to oil and gas exploration and development, may pose risks to polar bears. Lentfer (1990) noted that oil and gas development may lead to the following: death, injury, or harassment resulting from direct interactions with humans (including DLP killings); damage or destruction of essential habitat (especially denning habitats); attraction to or disturbance by industrial noise; and direct disturbance by aircraft, ships, or other vehicles. Additionally, it is well established that contact with and ingestion of oil from acute and chronic oil spills or other industrial chemicals can be fatal to polar bears (Oritsland et al. 1981; Amstrup et al. 1989). Some oil and gas activities may also affect polar bears indirectly by displacing ringed seals (Kelly et al. 1988).

Shipping

Current politics support the development of polar sea shipping routes and governments of the Arctic have promoted the expansion of the Northern Shipping Route (NSR), which passes through polar bear habitats. Increases in shipping through the Bering and Chukchi seas by icebreakers in the fall, winter, and spring has the potential to disrupt Alaska polar bears (USFWS 1995). Ships would likely use leads and polynyas to reduce transit time. Such areas are critical to polar bears, especially in winter and spring, and heavy shipping traffic could directly affect bears. Concomitant with increased traffic is the increased potential for accidents resulting in fuel spills that affect bears and their food chain.

SEA ICE ECOSYSTEM (PACIFIC WALRUS)

Global Climate Change

Because they are dependent on sea ice, polar bears are vulnerable to the effects of global climate change and subsequent alteration of sea ice habitats (Stirling and Derocher 1993; S. Schliebe, pers. comm.).

Unknown population size

The lack of reliable information about the current walrus population size, environmental carrying capacity, and many life history parameters makes it impossible to accurately determine OSP for this species. Determination of population status relative to OSP is important because it provides the basis for implementing regulatory activities that can influence population size and composition, and it indicates if conservation actions are effective and if additional actions are needed. Perhaps most importantly, an accurate estimate of population size is critical for setting sustainable harvest levels to ensure that overharvest does not reoccur (USFWS 1994).

Overharvest

The human activity with the greatest potential for impact on walrus numbers is hunting (Fay 1982, Fay et al. 1989). Natives on both sides of the Bering Strait hunted walruses from the Bering and Chukchi Seas for thousands of years before the 19th century and probably had little effect on the population (Fay 1982). Past commercial exploitation has severely reduced the population at least three times since the mid-1800's, but each time it recovered when protected (Fay et al. 1989). Estimates of the total annual kill of walruses during the mid-1980's (a period of high harvest) were 10,000 to 15,000 individuals, or 4 to 6 percent of the estimated minimum population (Sease and Chapman 1988, Fay et al. 1989). Recent harvest rates are lower than historic highs but lack of information about population size and trends precludes a meaningful assessment of the impact of the harvest (Garlich-Miller and Jay 2000).

Commercial fisheries interactions

Although commercial fisheries' impacts to feeding habitat and prey resources is not currently an issue with respect to walruses, it could become one if commercial harvesting of clams is done on a large scale (Fay and Lowry 1981). Available data on benthic resources are not sufficient to assess adequately the impacts of a clam fishery on walruses. However, studies have found that walrus may be near their environmental carrying capacity and thus, perturbations in its benthic food resources is likely to adversely affect the population (Fay et al. 1977). The potential also exists for adverse impacts to feeding habitats due to sea floor destruction from bottom trawls for fish (USFWS 1994). Incidental catch of walruses in the groundfish trawl fishery in the eastern Bering Sea has been low, (1-40 animals per year) according to observer data (USFWS 1994).

Human disturbance

Land based disturbance:

A major threat to walrus is disturbance by human activities, especially on terrestrial haulouts. Although responses of walruses to humans are variable, they often flee haulouts en masse (trampling calves in the process) in response to the sight, sound, and especially odors from humans and machines (Fay et al. 1984a, Kelly et al. 1986). Walruses also flee or avoid areas of intense industrial activity (Mansfield 1983, Brueggeman et al. 1990, 1992).

Disturbance on pack ice:

Increasing aircraft and boat traffic in the Bering and Chukchi Seas, largely associated with fisheries and petroleum exploration and development, may disturb walruses in important breeding, nursing, and feeding areas on pack ice (USFWS 1994). Females with young show the most negative response to noise disturbance and the greatest potential for harm occurs when mother and calf are separated. Polar bears will often take advantage of such separations of to prey on calves (Fay et al. 1984a).

SEA OTTERS

Commercial fisheries interactions

Competition for prey

Sea otters have voracious appetites and can significantly reduce local shellfish stocks. Following the extirpation of sea otters from Alaskan waters, the abundance of shellfish and other prey species presumably increased. Commercial, recreational, and subsistence shellfish fisheries subsequently developed in their absence and re-colonization by otters in these areas has led to competition for the same food resources (USFWS 1993) and, in some cases, the demise of recreational and commercial shellfish fisheries (e.g. Kimker 1985; Garshelis et al. 1986). Urchins are not presently commercially harvested due to lack of profitability, but this could change (V. Sokolov, pers. comm.). The proposed development of mariculture operations to grow clams, mussels, oysters and scallops could also threaten sea otters by displacing them from prime foraging areas and entangling them in fishing gear (Monson and DeGange 1988), or provoking the use of lethal means to exclude them from such areas.

Incidental take/ bycatch

Sea otters are taken incidentally in salmon gillnet fisheries and other fisheries in the Bering Sea. Although sample sizes are small, data from the observer programs in Prince William Sound and Copper River Flats drift and set gillnet fisheries, and the south Unimak Pass drift gillnet fishery, suggest that incidental mortality of sea otters in these fisheries is low (Wynn 1990; Wynne et al. 1991, 1992).

Oil spills

Sea otters rely strictly on fur for insulation: they lack the layer of blubber common to all other marine mammals. Without blubber, sea otters are particularly susceptible to hypothermia and death as a result of pelage contamination, and thus are at greater risk than any other marine mammal in the event of an oil spill in their present range (Costa and Kooyman 1982; Garshelis 1990; Geraci and St. Aubin 1990). For example, it is estimated that approximately 2,028 to 11,280 sea otters died in Alaska as a result of the Exxon Valdez oil spill of 1989; continuing studies suggest that otters are still affected by oil in their environment in western Prince William Sound (USFWS 1993).

7. Goals, Objectives and Strategic Actions

7.1 Vision for the Bering Sea

Our vision is that the Bering Sea has healthy, abundant, and diverse populations of invertebrates, fish, birds, marine mammals, and people.

To realize this vision, we will work toward:

- The U.S. and Russia sharing information, expertise and capacity;
- Developing focused research agendas that tease out ecological complexities and help to understand the linkages between human activities and species declines;
- Convening a multinational coalition of communities with a strong voice in decisions; and
- A carefully regulated fishery in both Russian and U.S. waters, with full participation by Bering Sea residents and other stakeholders and economic benefits accruing locally as well as to the larger Bering Sea absentee commercial interests.

To realize this vision, we must achieve:

- Fishing interests, conservationists, governments, and Bering Sea residents collaborating to reach jointly developed and shared goals;
- Residents of the Bering Sea being involved intimately in the issues that affect them, with full participation in decision-making, research, negotiation, and management;
- Communities with the tools, knowledge, and stewardship ethic needed to affect positive change;

As we do this work, we will honor and respect the knowledge, heritage, subsistence practices, local decision-making authority, economies and stewardship of the people and communities of the Bering Sea.

7.2 Objectives, Strategic Actions and Action Steps

In this section we list objectives and strategic actions to address the top-ranked threats identified through the threats analysis. We also include an over-arching objective to address the lack of scientific knowledge of processes and factors driving marine mammal, seabird and fish population trends in the Bering Sea. Finally, we describe four *integrated strategic actions*, each allowing an integrated approach to abating multiple threats, including locally significant threats.

We list *strategic actions* for all the objectives and note whether TNC and/or WWF plan to take on these projects, and where known, list other organizations that might logically take the lead. We have provided specific *action steps* for only some of the Strategic Actions that WWF and/or TNC plan to undertake within the next five years. The action steps listed serve as a starting point; additional attention to action steps (in the form of a project plan) will be required prior to initiating most of the strategic actions described in this plan.

This is not intended to be an exhaustive list of *objectives* or *strategic actions* for the Bering Sea. Rather, the primary focus is on abating primary threats and on providing detail for planned TNC & WWF actions. In cases where it is currently unclear if WWF or TNC will act on a strategy, we did not assign a role. While developing future iterations of this plan the plan team should consider if any strategies are required to directly address the biological features (versus the threats to those features).

While costs are listed for a five year timeframe, action on many of the strategies listed will be phased in over that time period. Therefore, we listed costs according to our estimates of when our actions will begin (e.g., following the conclusion of the PIC in two years). Annual costs are approximate and will likely vary during the life of a project.

#	Table 9: Objectives, Strategic Actions and Action Steps
Objective	**1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.**
Strategic action	Ensure that a network of protected areas is designed for resiliency in the face of climate change (see Integrated Strategic Action 2: Network of protected areas)
Strategic action	Bear witness to change and feed this into our respective climate change programs.
Action step #1	Participate in WWF Climate Witness Program by engaging communities to document impacts of climate change (e.g., depth to permafrost, river and sea ice thickness and persistence, etc.)
Objective	**2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.**
Strategic action	Establish an international research station in and for the Bering Sea.
Action step #1	Build financial and political support for hypothesis driven research on oceanographic processes and wildlife populations in the Bering Sea.
Strategic action	Compile research needs for Bering Sea. [Note current work by BEST, NPRB, ASLC, MMRC, NOAA, USFWS, PIC. Encourage NOAA lead role.]

#	Table 9: Objectives, Strategic Actions and Action Steps
Objective	**3a: Commercial Fisheries: Incidental Take of Seabirds and Marine Mammals: Reduce the number of albatross caught in longlines & nets by 50% by 2010 in US waters and by 2015 in Russian waters.**
Strategic action	Expand use of tori lines in Russian longline fleet
Action step #1	Expand education program with fishermen
Action step #2	Secure funding for tory lines and other equipment; purchase and ship.
Strategic action	Improve understanding of interactions between US fisheries and incidental seabird take
Action step #1	Better quantify seabird/gear interaction rate in trawl fisheries (Lead = USFWS)
Action step #2	Coordinate development of database of spatial and temporal distribution of all fishing effort in the Bering Sea.
Action step #3	Quantify drop-off rate for seabirds caught on longlines (those that go under and don't come up) (Lead = USFWS)
Strategic action	Obtain ban on high seas driftnet fisheries in Russia
Action step #1	Conduct an analysis of current highseas driftnet practices
Action step #2	Lobby Russian gov't
Strategic action	Establish Observer Program in Russia
Action step #1	Develop and implement project
Strategic action	Establish an international working group on fisheries/marine mammal conflict
Objective	**3b: Commercial Fisheries: Incidental Take of Seabirds and Marine Mammals: By 2006, determine**

#	Table 9: Objectives, Strategic Actions and Action Steps
	if incidental take outside of Bering Sea fisheries is a factor in pinniped declines.
Strategic action	Establish an international working group on fisheries/marine mammal conflict
Strategic action	Determine incidental take rates for Bering Sea pinnipeds in fisheries outside the Bering Sea
Objective	**3c: Commercial Fisheries: Habitat Damage: Eliminate use of habitat-damaging fishing gear in key coral & sponge gardens, other living substrates, and known crab nursery areas in Alaska by 2015 and in Russia by 2020.**
Strategic action	Gain broad acceptance of habitat values and locations and gear impacts among key stakeholders and fisheries regulators (through outreach: publications, conference, etc).
Action step #1	Document biodiversity and fisheries values of key habitats.
Action step #2	Document damage type, severity, and recovery by habitat type and gear.
Strategic action	Establish regulatory areas that prohibit damaging gear types in sensitive, high value habitats.
Action step #1	Advocate for increased deep sea and marine canyon underwater research
Action step #2	ID specific key specific habitat types and locations.
Action step #3	Leverage PIC experience to engage more broadly in NPFMC process.
Action step #4	Lobby Russian regulatory authorities

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Establish monitoring capacity in Russian waters to ensure regulations prohibiting habitat damaging gear types are being followed.
Strategic action	Develop and implement a network of protected areas (see Integrated Strategic Action 2: Network of protected areas)
Strategic action	Expand use of VMS in Russia to aid in monitoring and advocate for transparency in how VMS data is used
Objective	**3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.**
Strategic action	Catalyze long term research on food web dynamics as affected by commercial fisheries and climate change
Strategic action	Demonstrate feeding aggregation locations and foraging needs to key stakeholders and regulators.
Strategic action	Reach agreement among key stakeholders and regulators to seasonally eliminate fishing in key areas.
Objective	**3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.**
Objective	**3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.**
Objective	**3e: Overfishing: By 2015 (AK) & 2025 (Ru), no commercial fish stocks are overfished, stocks currently classified as overfished are “recovering” or “recovered” and stocks currently classified**

#	Table 9: Objectives, Strategic Actions and Action Steps
	as "recovering" have recovered.
Strategic action	Establish consistent stock status classification and monitoring between US and Russia.
Strategic action	Get Magnuson-Stevens Fisheries Act reauthorized with conflict of Interest provisions (See Objective 3g)
Strategic action	Determine if any inconsistent management measures exist that may be fostering overfishing and/or hindering recovery. (e.g., examine current stock assessments, recovery goals and plans, etc.)
Strategic action	Establish MSC certified community-based fisheries in Russian salmon and other fisheries
Action step #1	Assist communities with formal assessment process (experts, information, education on certification, etc.)
Action step #2	Assist communities with pre-assessment process (collect and synthesize data on status of stocks, etc.)
Action step #3	Help identify potential markets for certified products.
Action step #4	Identify other candidate community-base fisheries for MSC certification
Strategic action	Foster interagency coordination of fisheries enforcement efforts in Russia
Action step #1	Collect info on illegal trade
Action step #2	Experimental raids
Action step #3	Satellite monitoring
Action step #4	Training programs

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Obtain ban on high seas driftnet fisheries in Russia
Action step #1	Conduct an analysis of current highseas driftnet practices
Action step #2	Lobby Russian gov't
Objective	**3f: By-catch: By 2010 in Alaska by-catch does not exceed 5% of total harvest for any stock and does not exceed 5% of the total biomass of the bycatch species.**
Strategic action	Understand the current status and extent of bycatch in US and Russian fisheries
Action step #1	Determine bycatch rates in Alaska.
Action step #2	Determine if bycatch rates on observed vessels accurately reflects un-observed vessels.
Action step #3	Determine the ecological consequences of bycatch (by amount, type, cumulative effect, etc.)
Objective	**3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.**
Strategic action	Engage broadly in NPFMC council and related processes on fisheries management issues (overharvest, bycatch, ecosystem management).
Action step #1	Pribilof Island Collaborative as stepping stone
Strategic action	Reauthorization of the Magnuson- Stevens Fisheries Act with conflict of interest provisions
Action step #1	Broaden stakeholder representation on the regional Management Councils
Action step #2	Ensure that all players (e.g., consultants) with conflicts of interest are required to follow conflict of interest rules
Action step #3	Institute strong conflict of interest rules within Councils

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Develop consistent definitions and data collection across US-RU boundary
Action step #1	Advocate with US and Russian regulatory agencies
Strategic action	Implementation of best management practices in Russian fisheries. (see Objectives 3 a-f)
Objective	**4a: Oil Spill: By 2010, all oil spills > 100 gallons near key seabird colonies and marine mammal rookeries/haulouts have on-the-ground cleanup and containment response within 12 hours.**
Strategic action	Use Geographic Response Strategies (GRS) approach to identify highest priority at-risk locations and develop response plans.
Action step #1	Conduct an oil spill/vessel grounding risk analysis for the Aleutian and Commander Islands; identify gaps in current spill response preparedness.
Action step #2	Understand jurisdictions, laws, current standards, and state of response/prevention.
Strategic action	Establish Particularly Sensitive Sea Area (PSSAs) in Bering Sea (see Objective 9: Vessel Traffic)
Strategic action	Increase oil spill prevention, “polluter pays” approach, response plans, monitoring, equipment, and trained personnel.
Action step #1	Establish oil spill response programs on Commander Islands and in other Russian Bering Sea coastal communities
Action step #2	See GRS above
Strategic action	Develop and implement ecotourism best practices for the Bering Sea.
Objective	**4b: Oil Spill: By 2010, trace oil in selected Bering Sea harbors (St. Paul, St. George, Dutch, Adak, Akutan, Russian towns) will not exceed XX ppm.**

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Educate fishermen, shippers about biological effects of chronic oil spills. Gather background info on biological effects.
Action step #1	Develop & implement outreach/education strategy.
Action step #2	Gather background info on biological effects.
Strategic action	Initiate and sustain monitoring capacity in key places for chronic oil.
Action step #1	Include chronic oil monitoring in community monitoring programs. Initiate “Mussel Watch” program in Bering Sea.
Action step #2	Include in lobbying effort.
Objective	**5a: By 2010, eradicate introduced predators & grazers from 5 islands totaling 150,000 acres in the outer Aleutian Islands. By 2050, there are no introduced predators or grazers on islands in the Bering Sea.**
Strategic action	Establish partnership with Alaska Maritime NWR on island restoration and conservation to address invasive species concerns on Bering Sea Islands through eradication, on-ship control, ship wreck response, and prevention on high priority islands.
Action step #1	Broaden on-ship rat control efforts in AK and Russia
Action step #2	Complete legal and administrative requirements (e.g. EIS) (USFWS).
Action step #3	Create PR climate to enable eradication. Secure federal funding for Rat Eradication program.
Action step #4	Establish and enhance ship wreck response capability (USFWS lead)
Action step #5	Establish rat control programs at high priority currently infested ports in the Bering Sea. (Priority ports TBD with USFWS. Consider looking at ports of departure more broadly (e.g., Singapore, Seattle, etc.))

#	Table 9: Objectives, Strategic Actions and Action Steps
Action step #6	Establish rat prevention programs at high risk ports (i.e, ports on islands with at-risk bird colonies)
Action step #7	Test eradication methods (USFWS). Develop and implement pre and post treatment surveys (USFWS). Kill rats (USFWS).
Strategic action	Establish partnerships w/ Russian Gov't, Russian Aleutian District Administration, and Commander Islands Nature Reserve to address invasive species through eradication, on-ship control, ship wreck response, and prevention on high priority islands.
Strategic action	Establish a community-based monitoring and action program in Bering Sea coastal communities to monitor for rat and other invasive species introductions.
Objective	**5b: By 2010, all boat groundings and potential groundings will have on-the-ground rat prevention response within 12 hours.**
Strategic action	Establish partnership with Alaska Maritime NWR on island restoration and conservation to address invasive species concerns on Bering Sea Islands through eradication, on-ship control, ship wreck response, and prevention on high priority islands.
Action step #1	Broaden on-ship rat control efforts in AK and Russia
Action step #2	Complete legal and administrative requirements (e.g. EIS) (USFWS).
Action step #3	Create PR climate to enable eradication. Secure federal funding for Rat Eradication program.
Action step #4	Establish and enhance ship wreck response capability (USFWS lead)
Action step #5	Establish rat control programs at high priority currently infested ports in the Bering Sea. (Priority ports TBD with USFWS. Consider looking at ports of departure more broadly (e.g., Singapore, Seattle, etc.))

#	Table 9: Objectives, Strategic Actions and Action Steps
Action step #6	Establish rat prevention programs at high risk ports (i.e, ports on islands with at-risk bird colonies)
Action step #7	Test eradication methods (USFWS). Develop and implement pre and post treatment surveys (USFWS). Kill rats (USFWS).
Objective	**5c: Marine invasives never get a foot-hold in the Bering Sea**
Strategic action	Establish monitoring capacity for marine invasives in coastal communities, including Pribilofs, Dutch, Adak, Commanders, Anadyr.
Action step #1	Develop standardized monitoring methods.
Action step #2	Incorporate in community-based monitoring programs.
Action step #3	Secure funding for continued monitoring
Strategic action	Enhance ballast water treatment, at-sea exchange - voluntary and regulatory
Objective	**6a: Salmon Ranching and Farming: By 2050, no salmon farms will have been established in the Bering Sea.**
Strategic action	Maintain current prohibition on salmon farming in Alaska.
Action step #1	Get information about salmon farming into Bering Sea communities (incl. salmon fishermen).
Action step #2	Monitor AK legislature for emergence of salmon farming.

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Prevent expansion of salmon farming/ranching in Russia.
Action step #1	Develop & implement policy strategy
Action step #2	Evaluate policy framework in Russia for incentives/disincentives to farm/ranch salmon.
Objective	**6b: Salmon ranching and farming: By 2010, hatchery fish will not exceed XX% of total returns within a statistical area (in AK) and equivalent region in Russia.**
Strategic action	Reduce salmon ranching as proportion of overall salmon populations.
Action step #1	Get information about salmon ranching into Bering Sea communities (incl. salmon fishermen).
Action step #2	Research current level of hatchery returns by area; develop plans to take specific hatcheries off-line to achieve objective.
Action step #3	Work with State of Alaska, Russian authorities and fishery and hatchery groups to implement plan to take hatcheries off-line.
Strategic action	Prevent expansion of salmon farming/ranching in Russia.
Action step #1	Develop & implement policy strategy
Action step #2	Evaluate policy framework in Russia for incentives/disincentives to farm/ranch salmon.
Objective	**7a: Overhunting: By 2010, Alaska and Chukotka will have scientifically-managed, sustainable, subsistence harvests for polar bears and walrus.**

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Lobby for adoption of implementing legislation for International Polar Bear Treaty
Strategic action	Build capacity in Chukotka to enable science-based management and enforcement of hunting regulations
Strategic action	Provide education and technical assistance to Russian coastal communities to better manage dumps and other polar bear attractants
Strategic action	Provide technical assistance to Wrangell Island Zapovednik for polar bear conservation and management
Strategic action	Support continued research on status of Bering/Chukchi polar bear population
Strategic action	See also Integrated Strategy #2 (Protected areas/Beringia Park/Chukotka ecotourism)
Objective	**7b: Overhunting: By 2015, polar bear poaching in Chukotka and Alaska will be eliminated.**
Strategic action	Monitor the illegal sale and trade of polar bear skins within Russia
Strategic action	Monitor the illegal trade and export of polar bear skins from Russia
Strategic action	Build capacity in Chukotka to enable science-based management and enforcement of hunting regulations
Objective	**8: Marine Debris: By 2010, northern fur seal entanglement rates in Pribilof Islands, Bogoslof Island, and the Commander Islands <1% of females.**

#	Table 9: Objectives, Strategic Actions and Action Steps
Strategic action	Reduce at-sea dumping of debris and net discarding.
Action step #1	Education strategy on impact of discarded nets/patches and dumping of debris
Action step #2	Evaluate use/enforcement of Marpol.
Action step #3	Net and packing band tracking with coded signatures; penalty
Strategic action	Reduce existing debris at major fur seal rookeries and haulouts.
Action step #1	Annual cleanup on Pribilofs
Action step #2	Evaluate debris at Bogolsof Island and Commander Islands
Action step #3	Initiate community-based cleanup on Commanders.
Strategic action	Monitor rates of entanglement
Action step #1	Continue annual monitoring efforts on Pribilofs by tribes
Action step #2	Establish baseline data and protocols for Bogoslof
Action step #3	Establish baseline data, protocols and capacity in Commanders.
Strategic action	Develop methods of tracking the source of fishing gear, packing bands and other marine debris.
Objective	**9a: Vessel Traffic: The Northern Shipping Route, if opened, is managed according to an international management plan that includes fully-funded spill prevention & response, invasive**

#	Table 9: Objectives, Strategic Actions and Action Steps
	species prevention, avoidance of sensitive sites & other measures.
Strategic action	Establish trans-arctic shipping route as PSSA.
Objective	**Integrated Strategy #1: Pribilof Island Collaborative**
Strategic action	Establish a model of balanced, multi-stakeholder problem solving for marine issues, focusing first on the Pribilof Islands ecosystem.
Action step #1	Continue engagement in PIC through participation as stakeholders, by investing in data analysis, and by advancing a precautionary, science-based conservation agenda.
Objective	**Integrated Strategy #2: A comprehensive network of protected areas in sensitive and productive marine and coastal zones will be in place and fully supported by 2050.**
Strategic action	Implement Integrated Strategy #2
Action step #1	Designate Particularly Sensitive Sea Areas (PSSAs) in the Bering Sea
Action step #2	Build public support for protected areas strategy
Action step #3	Conduct a Bering Sea-wide assessment of sensitive habitats (e.g., estuaries, salmon spawning streams, living substrates, etc.); identify a strategic network of proposed protected areas; Obtain designations. Engage multiple partners
Action step #4	Create the Beringia International Park; ecotourism development in Chukotka; advocacy for Park creation.
Action step #5	Improve protection, management and financing of existing protected areas in the western Bering Sea.

#	Table 9: Objectives, Strategic Actions and Action Steps
Action step #6	Support for Commander Islands Reserve, including enforcement of the 30 mile zone.
Action step #7	Working through a National Implementation Support Program (NISP) agreement, implement Convention on Biodiversity COP 7 agreements in Russia
Objective	**Integrated Strategy #3: Establish a community-based monitoring and action network in the Bering Sea.**
Strategic action	Implement Integrated Strategy #3
Action step #1	Bring together and build on existing programs (e.g., WWF Coastal Communities in Science, Pribilof Stewardship Program, Pribilof Island Sentinel, APIA, ACAT, etc.) to develop a network of communities using consistent methods to monitor various aspects of their environment.
Action step #2	Engage multiple partners, including government agencies (e.g., YK Delta NWR)
Objective	**Integrated Strategy #4: Site-based action at platform sites: Pribilof and Commander Islands**
Strategic action	Implement Pribilof Island Conservation Plan
Action step #1	Continue engagement in Pribilof Islands Collaborative (see above)
Action step #2	Work with local partners to implement Pribilof Conservation Plan – address local threats through local partnerships
Strategic action	Complete and implement Commander Island Conservation Plan
Action step #1	Provide technical assistance, training and other resources to Commander Islands Nature Reserve
Action step #2	See also Objectives 4 & 8 (oil spill and marine debris)

#	Table 9: Objectives, Strategic Actions and Action Steps
Action step #3	Support for Commander Islands Reserve, including enforcement of the 30 mile zone.
Action step #4	Work with Audubon Alaska and other partners to complete and implement the Commander Islands conservation plan

8. MONITORING PLAN (MEASURING SUCCESS)

This section describes the monitoring plan for the Bering Sea Ecoregion. We plan to monitor all ten biological features highlighted in this Plan. However, monitoring activities for some biological features and threats are more fully developed at this time than for others; those features and threats with less detail should be addressed in future iterations if this Plan.

Seabirds

Indicator: Seabird population and productivity (murres, cormorants, kittiwakes)

Objectives:
-1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.

-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.

Methods: Review summary tables in annual Alaska Maritime NWR Seabird Monitoring Report
Priority: Very High
Status: Ongoing
Frequency and Timing: annual, report posted to the web by December
Location: Data compiled at AMNWR in Homer
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Cormorants: % breeding pairs producing chicks, population count

Key Attribute References by Target
(w/ current indicator status) : Seabirds

-Condition: Combined long term means (5 yr rolling average) for productivity & population
Priority: Yes

Indicator: Cormorants: three year rolling averages, both species
Priority: Yes

Indicator: Kittiwake: % breeding pairs producing chicks, population count

Key Attribute References by Target
(w/ current indicator status) : Seabirds
-Condition: Combined long term means (5 yr rolling average) for productivity & population
Priority: Yes

Indicator: Kittiwakes: 5 year rolling averages, both species
Priority: Yes

Indicator: Murres: % breeding pairs producing chicks, population count

Key Attribute References by Target
(w/ current indicator status) : Seabirds
-Condition: Combined long term means (5 yr rolling average) for productivity & population
Priority: Yes

Indicator: Murres: 3 year rolling averages, both species
Priority: Yes

Indicator: Presence of rats on specified islands; presence/absence of rats in traps based on FWS protocol

Objectives:
-5a: By 2010, eradicate introduced predators & grazers from 5 islands totaling 150,000 acres in the outer Aleutian Islands. By 2050, there are no introduced predators or grazers on islands in the Bering Sea.

-5b: By 2010, all boat groundings and potential groundings will have on-the-ground rat prevention response within 12 hours.

Methods: Work with Art Sowls, Vernon Byrd at USFWS to develop methods

Priority: High
Annual Cost: 0

Indicator: Presence/absence of rats
Priority: Yes

Indicator: Seabird bycatch rates by species

Objectives:
-3a: Commercial Fisheries: Incidental Take of Seabirds and Marine Mammals: Reduce the number of albatross caught in longlines & nets by 50% by 2010 in US waters and by 2015 in Russian waters.

Priority: Yes

Indicator: Shipwreck response time

Objectives:
-4a: Oil Spill: By 2010, all oil spills > 100 gallons near key seabird colonies and marine mammal rookeries/haulouts have on-the-ground cleanup and containment response within 12 hours.

-5b: By 2010, all boat groundings and potential groundings will have on-the-ground rat prevention response within 12 hours.

Methods: Methods need development. Data likely kept by USCG.
Priority: Medium
Status: Planned
Frequency and Timing: annual summary
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Tori line (streamer) use in Russia
Priority: Yes

Indicator: Short-tailed albatross incidental take

Objectives:
-3a: Commercial Fisheries: Incidental Take of Seabirds and Marine Mammals: Reduce the number of albatross caught in longlines & nets by 50% by 2010 in US waters and by 2015 in Russian waters.

Methods: Get US numbers from USFWS. Bycatch numbers in Russia are not available; need to develop data collection methods.
Priority: Medium
Status: Planned
Frequency and Timing: Annual
Location: Contact USFWS in Anchorage (contact?)
Who monitors: Steve MacLean, TNC; WWF-Ru for Russian incidental take data
Annual Cost: 0

Northern Bering Sea Pinnipeds

Indicator: BSAI Steller sea lion adult/juvenile count

Objectives:
-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.
-3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.
-3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.
Methods: Contact NMFS National Marine Mammal Lab for annual counts
Priority: Medium
Status: Planned
Frequency and Timing: annual in fall
Location: Seattle
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Female fur seal trip distance and duration

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Landscape Context: Prey availability

Objectives:

-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.
-3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.

Methods: Contact Rolf Ream at NMML
Priority: High
Status: Ongoing
Frequency and Timing: Data for this indicator are collected sporadically in special research projects rather than as on-going monitoring
Location: NMML - Seattle
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Harbor seal population growth rate

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Size: Population size & dynamics
Priority: Yes

Indicator: NFS bull counts
Priority: Yes

Indicator: NFS pup weight

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Landscape Context: Prey availability
Priority: Yes

Indicator: Northern fur seal bull and pup counts

Objectives:
-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

-3b: Commercial Fisheries: Incidental Take of Seabirds and Marine Mammals: By 2006, determine if incidental take outside of Bering Sea fisheries is a factor in pinniped declines.

-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.

Methods: Review NMML reports
Priority: Very High
Status: Ongoing
Frequency and Timing: Annual counts for bulls, every other year for pups
Location: NMML - Available on web
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Northern fur seal bull counts

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Size: Population size & dynamics
Priority: Yes

Indicator: Northern fur seal pup counts

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Size: Population size & dynamics
Priority: Yes

Indicator: Northern fur seal pup weights and starvations/ year

Objectives:
-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.
-3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.

Methods: Call Rolf Ream at NMML. Review reports produced by NMML
Priority: Very High
Status: Ongoing
Frequency and Timing: annually collected data
Location: NMML Seattle - likely available on Web
Who monitors: Steve MacLean
Annual Cost: 0

Indicator: Number (%) NFS pup starvations
Priority: Yes

Indicator: Number (%) NFS pup starvations/year

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Landscape Context: Prey availability
Priority: Yes

Indicator: Number (%) pup starvations
Priority: Yes

Indicator: Number of northern fur seal caught incidentally in commercial fisheries/year

Key Attribute References by Target
(w/ current indicator status) :
Pinnipeds
-Size: Population size & dynamics
Priority: Yes

Indicator: Percent of female northern fur seals entangled/year

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Size: Population size & dynamics

Objectives:
-8: Marine Debris: By 2010, northern fur seal entanglement rates in Pribilof Islands, Bogoslof Island, and the Commander Islands <1% of females.
Methods: Monitored annually by NMFS and St. Paul tribal government. Get data from tribal ECO office and NMML
Priority: High
Status: Planned
Frequency and Timing: annually in fall
Location: Call St. Paul and NMML, Seattle
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Steller sea lion adult/juvenile counts

Key Attribute References by Target
(w/ current indicator status) : Pinnipeds
-Size: Population size & dynamics

Objectives:
-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

-3d: Commercial Fisheries: Prey competition: By 2010 research will have established whether or not competition between birds/marine mammals and fisheries is a significant factor limiting populations and recovery of seabirds and marine mammals.

-3di: Objective: By 2015 in Alaska (2020 in Russia), there are no commercial fishing boats found in key marine mammal and seabird feeding areas during relevant seasons.
-3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.

Methods: Review Alaska Marine Mammal Stock Assessment Report from NMFS
Priority: High
Status: Planned
Frequency and Timing: Annual, available late fall
Location: Available on the web or via NMML, Seattle
Who monitors: Steve MacLean, TNC
Annual Cost: 0

<u>Pelagic Fish (Walleye Pollock and Pacific Salmon)</u>

Indicator: Hatchery fish as percent of overall returns

Objectives:
-3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.

-6a: Salmon Ranching and Farming: By 2050, no salmon farms will have been established in the Bering Sea.

-6b: Salmon ranching and farming: By 2010, hatchery fish will not exceed XX% of total returns within a statistical area (in AK) and equivalent region in Russia.

Methods: Methods need refinement; likely compare records on hatchery returns and compare with overall estimated Bering Sea harvest and escapement.
Priority: Low
Status: Planned
Frequency and Timing: Annual in fall
Location: ADFG reports - probably published on the web
Who monitors: TNC Salmon Director?
Annual Cost: 0

Indicator: Marine Trophic Index (MTI)

Key Attribute References by Target
(w/ current indicator status) : Pelagic Fish
-Condition: Sustainability of Pollock fishery

Objectives:
-3e: Overfishing: By 2015 (AK) & 2025 (Ru), no commercial fish stocks are overfished, stocks currently classified as overfished are "recovering" or "recovered" and stocks currently classified as "recovering" have recovered.

-3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.

Methods: Review annual Stock Assessment (e.g., Livingston, P. A. 2003. Trophic Level of the Catch, Ecosystem Considerations Chapter, Stock Assessment and Fishery Evaluation. National Marine Fisheries Service, Seattle, WA.)
Priority: Medium
Status: Planned
Frequency and Timing: Annual report
Location: NMFS Seattle; available on web
Who monitors: Steve MacLean
Annual Cost: 0

Indicator: Overfished stocks

Objectives:
-3e: Overfishing: By 2015 (AK) & 2025 (Ru), no commercial fish stocks are overfished, stocks currently classified as overfished are "recovering" or "recovered" and stocks currently classified as "recovering" have recovered.

-3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.

Methods: Review annual Stock Assessment (SAFE) document from NMFS
Priority: Medium
Status: Planned
Frequency and Timing: annual
Location: available on line
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Percentage of streams meeting salmon escapement goals

Key Attribute References by Target
(w/ current indicator status) : Pelagic Fish
-Size: Population size & dynamics

Objectives:
-3f: By-catch: By 2010 in Alaska by-catch does not exceed 5% of total harvest for any stock and does not exceed 5% of the total biomass of the bycatch species.

Methods: review ADFG escapement reports for selected streams in western AK. [Need to ID sentinel streams. Need to see if there is anything comparable in Russia.]
Priority: Low
Status: Planned
Frequency and Timing: annual
Location: Data from ADFG Comm Fish in Anchorage
Who monitors: Salmon Program Dir. @ TNC?
Annual Cost: 0

Indicator: Pollock biomass
Priority: Yes

Indicator: Pollock biomass as % of unfished biomass

Key Attribute References by Target
(w/ current indicator status) : Pelagic Fish
-Size: Pollock biomass

Objectives:
-3dii: Objective: By 2015 in Alaska (2020 in Russia), there are at least X metric tons of forage fish (e.g., squid, herring, juvenile pollock, sandlance, etc.) available to support food needs throughout marine mammal and seabird life cycles.
-3g: Fisheries Management: The management paradigm for fisheries in the Bering Sea is ecosystem-based, habitat-focused and precautionary by 2015 in Alaskan waters and by 2020 in Russian waters.

Methods: review annual SAFE report by NMFS
Priority: Medium
Status: Planned
Frequency and Timing: annual
Location: available on line
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Salmon bycatch of runs bound for sentinel streams
Priority: Yes

Indicator: Salmon escapement at sentinel streams
Priority: Yes

Indicator: Salmon escapement, harvest, and bycatch in sentinel streams

Objectives:
-3e: Overfishing: By 2015 (AK) & 2025 (Ru), no commercial fish stocks are overfished, stocks currently classified as overfished are “recovering” or “recovered” and stocks currently classified as “recovering” have recovered.

-3f: By-catch: By 2010 in Alaska by-catch does not exceed 5% of total harvest for any stock and does not exceed 5% of the total biomass of the bycatch species.

Methods: Need to ID sentinel streams, then data for harvest and escapement should be available from ADFG Comm Fish Division for Alaska. Getting bycatch data may be more difficult. Data for Russian stocks will also be problematic
Priority: Medium
Status: Planned
Frequency and Timing: annual
Location: ADFG office in Anchorage
Who monitors: TNC Salmon Director?
Annual Cost: 0

Indicator: Salmon harvest of runs in sentinel streams
Priority: Yes

<u>**Sea Ice Ecosystems**</u>

Indicator: Aerial extent and timing of pack ice (km2) over shelf; winter maximum and summer minimum

Key Attribute References by Target (w/ current indicator status) : Sea Ice Ecosystem
-Landscape Context: Sea ice habitat integrity
Priority: Yes

Indicator: Amount (km2) of multi-year ice vs. annual ice

Key Attribute References by Target (w/ current indicator status) : Sea Ice Ecosystem
-Landscape Context: Sea ice habitat integrity
Priority: Yes

Indicator: Sea ice extent, location, timing, and structure

Objectives:
-1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.

Methods: Work with USGS or USFWS to develop an annual monitoring method for this indicator. Should be able to get processed satellite data and overlay bathymetry.
Priority: Medium
Status: Planned
Frequency and Timing: annual
Location: Data sources are likely Geophysical Institute at UAF or USGS-BRD in Anchorage
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Polar bear body weight, physiological parameters, blood chemistry

Key Attribute References by Target
(w/ current indicator status) : Sea Ice Ecosystem
-Landscape Context: Prey availability

Objectives:
-1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.

Methods: Need to better develop methods; find out how data collected by hunters is collated and summarized. Talk to Scott Schliebe, FWS.
Priority: Medium
Status: Planned
Location: Anchorage
Who monitors: Steve MacLean
Annual Cost: 0

Indicator: Polar bear den surveys
Priority: Yes

Indicator: Polar bear population size

Key Attribute References by Target
(w/ current indicator status) : Sea Ice Ecosystem

-Size: Population size & dynamics

Objectives:
-1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.

Priority: Yes

Indicator: Walrus blubber thickness, blood chemistry

Key Attribute References by Target
(w/ current indicator status) : Sea Ice Ecosystem
-Landscape Context: Prey availability

Objectives:
-1: Climate Change: A genetically viable, healthy population of polar bears will persist in the Bering Sea.

-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

Methods: USFWS collects data on harvested walruses on an ongoing basis. Work with Joel Garlich-Miller to access data.
Priority: Medium
Status: Planned
Frequency and Timing: Annual
Location: Through USFWS regional office
Who monitors: Steve MacLean, TNC
Annual Cost: 0

<u>**Sea Otter**</u>

Indicator: population counts

Key Attribute References by Target
(w/ current indicator status) : Sea Otter
-Condition: Population structure & recruitment
Priority: Yes

Indicator: Sea otter adult/pup ratios

Key Attribute References by Target
(w/ current indicator status) :
Sea Otter
-Size: Population size & dynamics

Objectives:
-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

Methods: Contact Angie Doroff at USFWS in Anchorage.
Priority: Medium
Status: Planned
Frequency and Timing: annually in fall
Location: Anchorage
Who monitors: Steve MacLean
Annual Cost: 0
Detailed monitoring plan completed? (date + citation) : Extensive documentation at USFWS

Whales

Indicator: Baleen whale (krill feeder) population size
Priority: Yes

Indicator: Beluga population size

Key Attribute References by Target
(w/ current indicator status) : Whales
-Size: Population size & dynamics
Priority: Yes

Indicator: Fin whale population size

Key Attribute References by Target
(w/ current indicator status) : Whales
-Size: Population size & dynamics
Priority: Yes

Indicator: Gray whale population size

Key Attribute References by Target
(w/ current indicator status) : Whales

-Size: Population size & dynamics
Priority: Yes

Indicator: Orca population size

Key Attribute References by Target
(w/ current indicator status) :
Whales
-Size: Population size & dynamics
Priority: Yes

Indicator: Right whale population size

Key Attribute References by Target
(w/ current indicator status) : Whales
-Size: Population size & dynamics
Priority: Yes

Indicator: Sperm whale population
Priority: Yes

Indicator: Sperm whale population size

Key Attribute References by Target
(w/ current indicator status) :
Whales
-Size: Population size & dynamics
Priority: Yes

Indicator: Whale population and regulatory status (Gray, Fin, Sperm, Right, Orca, Beluga)

Objectives:
-2: Lack of Scientific Knowledge/Data: By 2020 the primary oceanographic and climate processes of the Bering Sea and the factors that drive marine mammal, seabird and fish population fluctuations are well understood by the science community.

Methods: Review annual Alaska Marine Mammal Stock Assessment Report available from NMFS
Priority: Medium
Status: Planned
Frequency and Timing: Annual, late fall
Location: Report available on web or through NMML, Seattle
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Coral and Sponge Gardens

Indicator: Amount (pounds) of corals and sponges in trawl bycatch

Key Attribute References by Target (w/ current indicator status) : Coral/sponge Gardens
-Size: Size, extent, and architecture of coral/sponge communities
Priority: Yes

Indicator: Coral and sponge bycatch amount

Objectives:
-3c: Commercial Fisheries: Habitat Damage: Eliminate use of habitat-damaging fishing gear in key coral & sponge gardens, other living substrates, and known crab nursery areas in Alaska by 2015 and in Russia by 2020.

Methods: This is reported annually by NMFS from observer data
Priority: High
Status: Planned
Frequency and Timing: annual
Location: NMFS - Auke Bay Lab in Juneau?
Who monitors: Steve MacLean, TNC
Annual Cost: 0

Indicator: Location, size, diversity of corals and sponges in bycatch
Priority: Yes

Bottom Dwelling Fish & Crab

Indicator: Nearshore species population

Key Attribute References by Target
(w/ current indicator status) : Bottom Dwelling Fish & Crab
-Size: Population size & dynamics
Priority: Yes

Indicator: Shelf break species population

Key Attribute References by Target
(w/ current indicator status) : Bottom Dwelling Fish & Crab

-Size: Population size & dynamics
Priority: Yes

Indicator: Shelf species population

Key Attribute References by Target
(w/ current indicator status) : Bottom Dwelling Fish & Crab
-Size: Population size & dynamics
Priority: Yes

<u>Coastal Lagoons & Freshwater Wetland Systems</u>

Indicator: Acres lost to facilities, roads, and other development

Target, Category, and Key Attribute References:
Coastal lagoons & freshwater wetland systems
-Size: Size / extent of characteristic communities / ecosystems

Maritime insular tundra
-Size: Size / extent of characteristic communities / ecosystems
Priority: Yes

Indicator: Breeding bird surveys

Target, Category, and Key Attribute References:
Coastal lagoons & freshwater wetland systems
-Condition: Waterfowl breeding
Priority: Yes

Indicator: Fall bird counts

Target, Category, and Key Attribute References:
Coastal lagoons & freshwater wetland systems
-Condition: Migratory bird feeding and resting
Priority: Yes

Indicator: numbers of juvenile fish from sampling

Target, Category, and Key Attribute References:
Coastal lagoons & freshwater wetland systems
-Condition: Fish nursery function

Priority: Yes

<u>Maritime Insular Tundra</u>

Indicator: Acres lost to facilities, roads, and other development

Target, Category, and Key Attribute References:
Maritime insular tundra
-Size: Size / extent of characteristic communities / ecosystems
Priority: Yes

Indicator: Change in abundance of climate indicator plant species

Target, Category, and Key Attribute References:
Maritime insular tundra
-Condition: community composition and structure
Priority: Yes

Indicator: Presence/number of non-native plant species in plot data

Target, Category, and Key Attribute References:
Maritime insular tundra
-Condition: Community composition and structure
Priority: Yes

Indicator: % of area impacted by grazing measured by plot surveys

Target, Category, and Key Attribute References: Maritime insular tundra
-Condition: Community composition and structure
Priority: Yes

9. RECOMMENDATIONS FOR SUBSEQUENT PLANNING EFFORTS (NEXT STEPS)

9.1 Engaging Other Partners

With this first iteration plan WWF and TNC have initiated an on-going, iterative planning process designed to incorporate new information and new partners over time and to allow for adaptive learning. While developing this first iteration plan WWF and TNC introduced the concept of a broad, multi-stakeholder plan to a few key partners, including USFWS, NMFS, and the Bering Sea Forum. Below is a list of partner organizations we hope to engage in next iterations of this plan (Table 10; Also see Part II "Other Resources", Section 2 for information about these and other potential partner organizations in the Bering Sea Ecoregion)

9.2 Next Iterations

WWF and TNC will use this plan to guide our conservation efforts during the next 2 years. We will also use the plan to initiate discussions with additional NGOs and stakeholders about contributing to the on-going planning process with the goal of having multiple partners engaged in coordinated conservation efforts in the Bering Sea. We further hope that many of these partners will formally sign on to the plan. By 2007 we, with the help of additional partners, will produce the next iteration of this plan.

9.3 Next Steps

We recommend the following next steps:

- By April 1, 2005 WWF and TNC rollout this plan with contributing scientists and partners.
- By December 31, 2005 WWF and TNC meet one-on-one or in small groups with at least 10 partner organizations to engage them in the planning process and plan implementation

We recommend that the next iteration of this plan:

- Include defensible viability targets for all biological features (where data exists);
- Be peer-reviewed by US and Russian science communities and all engaged partner organizations;
- Be completed by January 1, 2007;

Be a second of several iterations; part of an on-going process that continues to engage diverse partners in Bering Sea conservation.

Table 10: Partners to Engage in Coordinated Bering Sea Conservation - 5 Year Horizon

Alaskan
Alaska Marine Conservation Council
Alaska Nanuuq Commission
Aleutian/Pribilof Islands Association
Audubon Alaska
Marine Conservation Alliance
Native Villages
Chevak
Hooper Bay
Mekoryuk
Newtok
Paimiut
Russian Mission
Scammon Bay
Unalakleet
Other Alaskan and Russian communities to be determined
Oceana
Pribilof Islands Stewardship Program
The Ocean Conservancy
Tribal Government of St Paul
Tribal Government of St. George
USFWS – Alaska Maritime National Wildlife Refuge
USFWS – Migratory Birds
Yukon Kuskokwim Health Corporation
International
Bering Sea Forum
Beringia Ethnic-Nature Park
Pacific Environment
TRAFFIC - Europe
Wild Salmon Center
Russian
Association of Traditional Marine Mammal Hunters of Chukotka
Commander Islands Nature Reserve
Kaira Club
Kamchatka League of Independent Experts
Sevosryvod (Kamchatka/Northeast Fisheries Management Agency)

10. ACKNOWLEDGEMENTS

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12. END NOTE

The Strategic Action Plan (Part I, above) is meant to function as a stand-alone document. However, supporting documents were produced (Part II: Other Resources) and follow this section (in the full-bound version), or can be obtained by contacting the TNC or WWF Alaska field offices.

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